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ABSTRACT

To determine requirements of a statistical information system for meeting projected manpower requirements of the 1970's and 1980's, a historical review was made of manpower developments and problems in Europe and the United States. By the 1950's the importance of adequate manpower and labor force information in the United States had been established, but efficacy of the information was not studied until 1961 when a federal committee was appointed to appraise employment and unemployment statistics. In the early 1960's the manpower information emphasis began to shift from improvement and expansion of data input to efficient management of data output. Factors responsible for this emphasis shift were: (1) rapid expansion of "active manpower policy" legislation, (2) increasing heterogenity of manpower statistics sources, (3) interdisciplinary aspects, (4) introduction of planning, programing, and budgeting systems, and (5) labor market mechanisms. Information systems have been developed, but most are directed to the internal labor market of companies and government agencies. Only a few are nationwide, and these are limited to specialized and selected manpower groups. A more comprehensive nationwide data storage-retrieval system is feasible, but there are certain ethical and technological problems requiring solutions. (SB)

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# On the Evolution of Manpower Statistics

J. E. Morton

THE W. E. UPJOHN INSTITUTE FOR EMPLOYMENT RESEARCH
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# ON THE EVOLUTION OF MANPOWER STATISTICS

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By

J. E. MORTON

*December 1969*

*The W. E. Upjohn Institute for Employment Research*
*300 South Westnedge Avenue*
*Kalamazoo, Michigan 49007*

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## for Employment Research

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Dr. Morton is a Fellow of the Royal Statistical Society, London, and a Phi Beta Kappa from Cornell. He is listed in *American Men of Science* and *The International Yearbook of Who's Who.*

# Preface

This study began as an exploration of the requirements of a statistical information system for meeting the challenges to manpower policy foreseen for the 1970's and 1980's. It soon became apparent that insights and guidance could be gained from an extension of the inquiry to include experience of the past and of other countries and cultures. In this connection, I have benefited particularly from discussions with Mr. Rokuro Hotani, of the Japanese Ministry of Labor.

The views I express in this study are my own and do not necessarily represent positions of the W. E. Upjohn Institute for Employment Research.

J. E. Morton

*Washington, D.C.*
*November 1969*

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# I. Early Roots in European History

In this latter part of the twentieth century, manpower policy and manpower information to support policy are generally taken for granted as conventional institutions of our society. However, the active history of their application to manpower problems is relatively brief. Some of the manpower problems present, but only dimly recognized, in the early formative days of European nations are therefore still extant in one shape or another in various nations, including the United States. This chapter's review of some of the early problems and the reasons for their lack of solution may assist understanding of present issues on our own manpower scene.

Manpower problems are probably as old as mankind — or at least as old as the first prehistoric attempts of men to achieve some sort of organized community effort, whether hunting, herding, crop-raising, or war. In any case, a large part of the earliest recorded history manifests the existence of manpower problems in its descriptions of major migrations and of wars waged for subjugation and annexation. For that point in time, the manifestations can be termed rudimentary manpower policy. Though primitive and blundering, they were direct (probably intuitive) responses to seemingly intolerable manpower problems. Some of the problems originated from surplus manpower pressure against resource limitations, others from depletion or deficiencies of manpower reservoirs. Various other rudimentary ways to deal with manpower difficulties can be traced through early history, but we would have to term all of them improvisations rather than explicit policy in our modern sense of the term — especially since during much of that early time the idea of "manpower problems" was not yet fully conceptualized.

Thus, manpower policy and manpower information, as we define them, are relative newcomers to Western civilization. A certain matrix of elements had to develop before these two interdependent institutions could make their proper entrance: for manpower policy to exist, manpower problems had to be identified; an intention and a decision mechanism to do something about the problems must exist; and finally there must be an inclination to base the course of action (at least ostensibly) on factual knowledge, i.e. statistical manpower information.

The decision mechanisms which have made manpower policy possible were themselves inventions that emerged only very gradually, along with the development and articulation of Western society. As to information, two functional types can be defined, and one of them — documentary information — emerged quite early. The other — operating information — although sometimes submerged in documentary information, took a longer time to appear on its own. Since its essential function was to provide underpinning for manpower policy decisions, very few vestiges of it could be identified until the process of manpower policy became more identifiable.

The early introduction of documentary information was in part the consequence of highly developed systems of jurisprudence — for example, the Praetorian Law of ancient Rome, the code of laws *(Corpus Juris Civilis)* published by Byzantine Emperor Justinian, and the Middle Ages' accumulated body of canonical law — in which documentary evidence of explicit and rational procedures was an integral part. Furthermore, public administrative procedures in Roman times and throughout the Middle Ages generated a mass of lists, registers, and the like. Although the information from these sources is precious to the modern historian, in its own time it was not used as a basis for government policy or private managerial decisions on manpower. The nonuse is especially clear when one examines such managerial institutions of the Middle Ages as the princely courts, manors, guilds, clans, and extended households. Nevertheless, this early documentary information was the progenitor of similar evidence that would be used as the bedrock in later operating information systems.

## *The Precapitalist Period*

The few manpower problems that were identified during the early medieval period were solved mainly through custom and tradition. The stability — i.e., lack of radical or frequent change — of institutions, technology, and, numerically, populations simplified most such problems considerably. In addition, the relative fragmentation of much of the social structure limited communication between the potential decision nuclei. Major manpower catastrophes, such as the Black Death in the fourteenth century and the numerous series of wars and sieges throughout the Middle Ages, were accepted complacently, along with the rest of the prevailing order, as being divinely ordained. And since a large part of the manpower supply was either indentured or slave labor, both geographic and functional mobility were in the main negligible.

Within this general framework, however, were certain enclaves in various parts of Europe with characteristics that differed from those of the prevailing irrational and traditional socioeconomic climate: the Papal Household; the French and English royal courts; many of the monastic orders; and the large trading companies in Italy and north Germany. These were all entities whose existence depended on some degree of rational organization; therefore they needed to develop the kind of administrative and management procedures which called for quantitative information. The initial developments were somewhat low key, but they must be credited with providing (1) the early roots of rational management and administrative procedures and (2) the foundation for applying information to decision making in both the private and public sector.

In this context, it is interesting to consider the chronological relationship between the evolving socioeconomic structures of European states and the invention (or adaptation) of the various instrumentalities that were necessary before any extensive use of the "art of reckoning" could be made. For example, positional numeration, which is indispensable to the art and was apparently known in India as far back as the eighth (or possibly ninth) century B.C.,[1] reached Europe (specifically Spain) via the Arabs at about the beginning of the eleventh century A.D. Only after its arrival and subsequent acceptance could accountability and calculability find their way into the decision making of those who were concerned with business, budgetary, and fiscal problems. The invention of bookkeeping is usually credited to the Franciscan Luca (Paccioli), who published his system in Venice in 1492.[2] However, some of the basic concepts of the technique had been developed during the thirteenth and fourteenth centuries in Italy and France, including the idea of the account itself and the dichotomy of double-entry bookkeeping (often referred to as *a la Venezia* method). In the fifteenth century the classification of the total account into profit, loss, and capital account was developed; with this invention it was finally possible to conceive of accounting as a description of a closed system wherein funds flowed through an enterprise.

Curiously enough, the simple device of comparing alternative courses of action by striking a balance had still not been broached. This primitive procedure (foreshadowing, however, the much more complex cost-benefit calculus of our own time) was not included in the system until the seventeenth century, when Dutch mathematician Simon Stevin suggested, in concept, a simple model for the treatment and comparison of inputs and outputs.[3] The model was not very efficient, because the quality of the input information was poor. And not until at least another generation later was the valuation problem in connection with inventorizing discovered. Jacques Savary is generally credited with the discovery, but Werner Sombart may be right in doubting that a real identification problem actually emerged much before the end of the eighteenth century.[4]

Obviously, the above brief notations trace, ex post facto, only the literary landmarks that contributed to the art of reckoning. The actual development of the art was erratic and uncertain. The inventions described in the literature seeped very slowly through to the grassroots of economic and political life, in part because competent specialists (comparable perhaps to the operations-research specialists of today) in these matters, and particularly in the art of reckoning, were in very short supply. That the special technical education needed was not easily found is illustrated in an anecdote (relayed by Tobias Dantzig) concerning a German merchant of the fifteenth century who asked a famous professor for advice on the best education for his son. Dantzig describes the reply:

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[1] B. Datta and A. N. Singh, *History of Hindu Mathematics* (Lahore: Barnarsi Das, 1935-1938).

[2] Fra Luca da Bargo, *Summa de arithmetica, geometria proportioni e proportionalitá;* English translation, *Double Entry Book-keeping* (London: Institute of Book-keepers, 1866).

[3] Simon Stevin, *Wisconstighe Ghedachtenissen* (1605-1608); French translation, A. Girard (ed.), *Les oeuvres mathématiques* (Leyden: B. & A. Elsevier, 1634).

[4] Jacques Savary, *Le parfait Négociant* (Paris: J. Guignard fils, 1675); also see Werner Sombart, *Der moderne Kapitalismus* (Munich and Leipzig: Duncker and Humblot, 1924-1927), Vol. II, Part 1.

> If the mathematical curriculum of the young man was to be confined to adding and subtracting, he perhaps could obtain the instruction in a German university; but the art of multiplying and dividing, he continued, had been greatly developed in Italy, which in his opinion was the only country where such advanced instruction could be obtained.[5]

The anecdote also illustrates (obliquely) another important reason for the erratic course of practical developments. Broader acceptance and use of accounting techniques and concepts could take place only after enough decision makers perceived them as clearly advantageous devices for allocating resources — in particular capital resources — at a time when need for them was felt. In regard to money accounting, this first took place among merchants and bankers in the northern regions of Italy. (As noted above, some of the early literary concepts of the rudiments of bookkeeping originated in Italy.) The motivations for putting these concepts into practice is usually ascribed to the expansion of business units beyond the limits of the family corporation, where there was assumed to be little need for detailed record-keeping because of the inherent "relationship of trust."[6] Motivation was also enhanced by the gradual shift at that time from cash to credit transactions and the lengthening of the transaction period. However, all of the factors of the practical development in Italy — which soon spread from there to Germany and The Netherlands — were basically a part of Europe's incipient turnaway from medieval traditionalism and the "vague" toward calculability and the "exact," so that a climate could develop for receptiveness to quantitative data.

The Italian application of reckoning concepts was not directly relevant to manpower accounting problems of the time, but it was an invaluable expansion of what had previously been only a literary exercise. (The sector in which capital accounting concepts were more nearly applicable to manpower was the slave economy. This is discussed later in the chapter.) For money accounting, the needed data accrued almost automatically from what we term today a firm's operating statistics.[7] Statistical information for comparable manpower decisions, especially on high policy levels, was still very hard to come by, although awareness of the need and various suggestions for solving the problem had been evident for some time. However, documentary evidence on population existed, and this was, for all practical purposes, identical with manpower information. Throughout the Middle Ages population information had been a necessity to, for example, the princely courts in various towns as a basis for solving the vexing problem of military service; moreover, periodic food shortages had generated concern about knowing how many mouths there were to feed.

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[5] Tobias Dantzig, *Number: The Language of Science* (Doubleday, 1954), p. 26.

[6] Compare also with Toennies' concept of *Gemeinschaft,* in Ferdinand Toennies, *Community and Society* (Michigan State University Press, 1957), a translation from the original 1888 German edition.

[7] The term "statistics" is usually credited to the German political scientist Gottfried Achenwall, born in 1719, who derived the term from the Italian *statista,* for statesman, and *Ragione di stato,* for political administration.

The famous tract *de la République,* published in 1576 by French political economist Jean Bodin, contained an argument for taking population censuses (in the Roman tradition) to permit more efficient use of the government's police powers. The information to be collected also included some data on what today we would call economic manpower characteristics. Throughout the sixteenth and seventeenth centuries there were numerous similar suggestions — and sometimes demands — for such data, but this quest for information was only very slowly implemented by systematic collection.

Again, a certain conjunction of social and political circumstances was needed to produce the kind of decision framework that would demand precise population information. These circumstances were furnished by the gradual dissolution of the medieval town economy and the emergence of a new political entity — the nation-state.

Throughout the Middle Ages, the towns had an occasional, but direct, interest in population data in support of their "policy of provisions." The policy (which originated in Castile) aimed at local protectionism and was mainly concerned with assuring the towns' food supply through prohibiting exports and fostering agricultural production.[8] Thus, most of the early population enumerations served as the basis for determining the food needed to maintain the various elements of the active population — craftsmen, merchants, and soldiers, as well as their dependents. One of the earliest of these manpower enumerations, mainly limited to active population, was the census of Nuernberg (1449). As with most intelligence of this kind, the results were kept strictly secret for 200 years.

By the fifteenth century, preconditions were slowly evolving for the development of rational manpower policies, as the old social and economic order began showing signs of disintegration in most parts of Western Europe, with a consequent loosening of the ideological structure. In the new environment of thought, rational patterns found a more favorable rooting soil. This particular transition from predominantly prerational and traditional attitudes to rational and purposeful social (and individual) behavior is one of the most remarkable aspects of Western civilization. The search by scholars for an explanation of the transition has involved much conjecture. Some searchers have assigned it to the changes in religious tenets brought about by the Reformation and especially by Calvinism (Troeltsch, Max Weber, and Tawney), others to the impact of socioeconomic factors (Marx, Mannheim), and there are a fairly large number of other assignments.

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[8] See Eli Heckshér, *Mercantilism* (London: Allen and Unwin, 1934), Vol. II, pp. 80 ff.

For the issue at hand here, the importance of the "new order" lies in its gradual initiation of the climate in which decisions could eventually be made on a purpose-oriented, rational, and calculating basis. This is the minimum prerequisite for extensive use of quantitative data in the formulation of policy and managerial procedures in today's meaning of those terms. As noted earlier, the emergence of articulate manpower policy that called for a basis of facts was long restrained by the medieval concept of man's role within the scheme of things. And without doubt the diminishing of these restraining concepts was especially aided by the emergence of the nation-state and the later crystallization of a type of labor and job market not earlier known.

## *The Birth of the Rational State*

The so-called nation-state, that is, the first version of the modern nation based on rational, calculable law and on an expert bureaucracy, was the initial post-medieval carrier of economic and social "policy" as the term is understood today. The general ideas underlying the concept of this part of the state's function were developed by the mercantilists in Western Europe and by the cameralists in Central Europe.[9] Although the roots of mercantilist thought can be traced as far back as the end of the fourteenth century (e.g., the emerging foreign trade policy under England's Richard II), mercantilism as an operating system was a product of the late sixteenth century and early seventeenth, reaching maturity only step by step. Thus, the new political entity had to establish itself by struggling on one hand against medieval universalism (the universal church and the Holy Roman Empire with their grand strategies) and, on the other, against medieval particularism (the traditionalism and tactics of the medieval towns, guilds, large merchant corporations, and monastic orders).[10] In the course of the struggle the nation-state had to develop its own independent goals, instrumentalities, and procedures — in other words, a national policy. In this context manpower goals and policies began slowly to emerge.

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[9] Mercantile system, or mercantilism, was the name given in West Europe to the economic policies and practices followed by various European states during the seventeenth and eighteenth centuries. The term was brought into use by Adam Smith, although he used it loosely. Its own practitioners never used it. As a generic expression, it covers the practices that were known in France as colbertism and in Germany and Austria as cameralism.

[10] Heckscher, *op. cit.* (see our footnote 8 above); also see Gustav Schmoller, *Umrisse und Untersuchungen zur Verfassungs, Verwaltungs und Wirtschaftsgeschichte* (Munich and Leipzig: Duncker and Humblot, 1898).

Since one of the prime objectives of mercantilism was an active fiscal policy and the achievement of a "positive balance of trade" (i.e., a large export surplus), the immediate manpower implication was a large supply of labor. Very few of the population could survive for long without work of some kind; at the same time the occupational and skill articulation of the population as a potential work force was in general minimal. Hence, manpower requirements suggested that large populations were in favor and that ways must be found to combat tendencies toward idleness. The instrumentalities first used to support these goals included low wages, tax incentives, child labor, and the discouragement of nonparticipation in the work force.

Implementation of such measures scarcely required elaborate information. Operating data were of course available here and there, as illustrated by the rather intricate manpower tables for the armies of the various German states, but use of the data was limited to such decisions as how best to equip and house the soldiers. This and other information collected by the government was jealously protected and considered as a state secret that was subject to frequent espionage activity by foreign governments. It was hardly useful as a base for arriving at public or private management decisions re manpower at large.

Next to the nation-state and its increasingly elaborate administrative machinery, the two most important centers of concern about manpower problems were (1) the mercantile and craft guilds, which, although their medieval character was changing, were still very much in existence, and (2) the more recently created journeymen's organizations.

### *Remnants of Guild Tradition*

The guilds, both mercantile and craft, had a very long history, which was by no means limited to the Western world.[11] The craft guilds had been created for the regulation of the crafts (the Métiers in France, the Zuenfte and Innungen in Central Europe), each of which was under the supervision of some specific local ruling authority. Their express purpose was to serve as workers' associations with clear-cut monopolistic tendencies. Henri Pirenne (in *Les Villes du Moyen Age)* describes them as "privileged groups of artisans, endowed with the exclusive right to practice a certain profession" (the term "profession" was apparently used here in accordance with the medieval usage — which identified "occupation" with "profession" or "calling").[12] They regulated such matters as working hours, wages, and the number of "employees" per establishment — i.e., the number of apprentices and journeymen permissible per master craftsman. Thus, the framework of the guild organization served as a labor market, albeit not a free one.

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[11] Charles Gross, *The Guild Merchant* (Oxford: Clarendon Press, 1890), 2 Vols.

[12] For a concise yet comprehensive description of the situation in Europe as a whole, see Pirenne, *Encyclopedia of the Social Sciences* (Macmillan, 1948), Vol. VII, pp. 208 ff.

By the end of the fourteenth century, the regulations and "policy goals" were practically frozen, but the system remained in existence for a long time after that — for example, in France until the end of the eighteenth century, in England through the first quarter of the nineteenth century, and in Prussia through the first half of the nineteenth. However, the labor market role of the system changed quite early, because of a gradual tightening of vertical mobility — that is, apprentices and journeymen found it increasingly difficult to reach the rank of master. This led to the creation of separate organizations by two of the guild components, the masters and the journeymen. In the sixteenth century, the first such organizations were founded by journeymen in France and in the German states; the English journeymen fraternities were initiated somewhat later. The seventeenth century saw the beginning of masters' organization — for example, the French Corps de Métier and the English Livrey Companies.[13]

The ensuing labor market organization (the term is necessarily used here figuratively rather than literally) was the instrumentality through which the guilds' manpower goals were translated into reality. The goals had been and remained monopolistic and restrictive, and acceptance of them was based on rigid tradition. But the system seems to have worked to the satisfaction of those involved, without any felt need for other than routine decisions and arrangements and without recourse to information-based policies and strategies. The historian can, of course, find well-preserved documents bearing on manpower — e.g., guild records and personal tax registers (for Dresden, Zurich, and Danzig), church registers (especially for Sweden), and the like — but such information was never intended to be used to assist the formulation of manpower policies. The problem of matching men with jobs was met either by hereditary arrangements and social and personal contact, or by trial and error through the peculiar horizontal mobility inherent in the particular organization of training and education of the times.

The guilds' institutional vehicle — known as *Wanderschaft* or *Tour de France* — was in essence an obligatory traveling period for young journeymen, through which they would gather experience while working under different masters. To facilitate the travel and the location of a job, the guilds provided an elaborate system of inns *(Herberge)*; in some localities each of the major crafts maintained a separate inn. The inns were administered by the local craft organization (either the masters' or the journeymen's) through the innkeeper *(Her-*

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[13] H. Hauser, in *Encyclopedia of the Social Sciences* (Macmillan, 1948), Vol. VIII, pp. 424 ff.

*bergsvater)*. The traveling journeyman would stop at "his" inn, identify himself through an often complex ritual (the handshakes of the student fraternities of our time are a survival of this custom). He would then register with the secretary of the local organization, who would try to ensure proper job placement for him. But if the maximum permissible number of journeymen per master had already been reached, the now "surplus" worker would be directed to a neighboring community and, frequently, provided with the necessary means to get there. No formal information system re job openings existed. Communication was entirely by word of mouth, and often the missing local information link was provided by specialized journeymen, who had to be paid by the applicant for their "employment services."

Even though the inn system found it necessary, early in the eighteenth century, to coordinate its administrative aspects by creating centralized regional federations, coordinated information networks were apparently still not deemed necessary or feasible. However, one important aspect of job placement — the occupational characteristics of "applicants" — had of course long been taken care of implicitly by the medieval concept of occupation that was basic to the operation of the guild system. This concept was usually expressed by the German word *Beruf* (profession, in the sense of "calling"), which implied not only occupation and aptitude but also that a man's occupation was his God-given duty. It was one of the main elements in the secret identification ritual for the traveling journeymen, which was uniform in Central Europe over the entire system. The ritual's clear objective was to give proof that a particular applicant, because he was a member in good standing of a specific guild, was properly qualified as to (1) his skill and aptitude, and (2) his positive attitude toward work in the given occupation.[14] The concept persisted through many generations. Only after the many socioeconomic changes in the latter part of the eighteenth century did the term "occupation" begin to assume the connotation of "gainful employment" in one of the several emerging economic divisions.

In many respects, this signaling by the guild system of a person's job skills and attitudes through his identification with an institution that was well known to the society of the time was an ancestor of the battery of aptitude and other tests administered to a present-day job applicant in relation to a specific "job description." The guild system's identification covered all three of the main aspects of the occupation — technological (the specific operations involved), economic (the income-creating aspects), and sociopsychological ("prestige" and the like). All of this was generally understood because the rigid corporate organization that was characteristic of the Middle Ages had provided a clear taxonomy of occupations, beginning as far back as Charlemagne's *capitulary*

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[14] W. Lins, in *Handwoerterbuch der Staatswissenschaften* (4th edition; Jena: G. Fisher, 1923-1928), Vol. I, pp. 824 ff.

*de Villis,*[15] which listed approximately twelve occupations, up to the *register de Taille* published in Paris in 1292, which listed some four hundred and fifty occupations.

The medieval manpower structure represented by the guild system assumed the existence of near-perfect vertical mobility, stable social institutions, unchanging economic behavior, and a more-or-less stationary population. Yet as early as the fifteenth century various aspects of all of these elements had begun to crumble. The impact on the structure was gradual but unmistakable and was accentuated by such changes in attitude and values as the swing toward purpose-oriented behavior and explicit weighing of means and ends (Max Weber's "*Zweckrationalitaet*"). The new social and economic order, as well as the military and fiscal ambitions of the new nation-states, necessarily emphasized increased productivity and export expansion. Manpower thus began to be viewed as a most desirable "national resource" that was scarce both in number and in quality. The still prevailing — but already disintegrating — guild system, whose restrictive policies had provided the dominant framework for matching men with jobs, no longer seemed able to cope with the problem.

Certain legacies of the handicraft-oriented tradition — such as the purposive slowness of work processes and the placid acceptance of a given standard of living and of the concepts of "just price" and "just wage" — hampered efforts to increase manpower productivity to the extent the new order began to demand.[16] Thus policies supposed to be aimed at enlarging the size of the manpower reservoir — and improving its quality — frequently turned out to be fairly futile efforts to pressure the idle or underemployed through such crude devices as threats of workhouse incarceration. This poorly reasoned implementation often defeated the policy objective, and invocation of the poor laws reduced labor mobility, further accentuating the manpower shortage.

Training facilities, too, were limited in both scope and objectives. Generally, they were aimed, not at skill acquisition, but at producing more favorable attitudes toward work. The training problem was complicated by the empirical nature of the work processes, which could be easily learned or taught only through daily work experience as provided in the actual workshop.

Not much, if any, thought was given to identifying the looming manpower problem and sorting out its complex aspects. The guild system masters, responsible for the direction of the production units, were now little more than co-workers and did not assume any management functions as we know them today. No one in authority seemed interested in exploring the interrelation of manpower shortages, mobility, training, technology, and procedures for matching men and jobs. (Personnel management, job counseling, and social security measures — today a frequent source of operating information on the micro and the macro levels — were as yet unknown.)

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[15] Arthur Salz, in *Encyclopedia of the Social Sciences,* Vol. VI, pp. 424 ff.

[16] *Cambridge Economic History of Europe* (Cambridge University Press, 1965), Vol. VI, p, 291.

Numerous questions were raised on these matters by individuals who were not directly concerned with implementing policy or with making manpower decisions on the operating level — writers and researchers who wished to satisfy their own moral and intellectual curiosity. This group included the first producers of quantitative information pertaining to manpower — the political arithmeticians, early demographers, geographers, and "statisticians." Unfortunately, the information was used to describe specific conditions and countries in much the same way that compilers of almanacs and run-of-the-mill travel accounts do in our own day. This purely descriptive character of demography and other studies relevant to manpower survived for a long time.

Many generations passed before interest in more precise analytical information was manifested by any but a few brilliant workers here and there. However, in view of the modest goals of manpower policy at that time and the lack of sophistication in attempts to achieve them, whatever information was readily available was apparently sufficient. Only when Europe began to move into an industrial system was there noticeable change in the situation. The discovery of the manpower information problem first occurred on aggregative levels, and again it was the necessity of the still young nation-states to be concerned about population and manpower issues that brought about the first serious efforts to develop systematic demographic inventories.

In the general area that today is termed "social study," the Baconian method was first applied to political arithmetic and demography when these disciplines were still limited to descriptive information on populations.[17] The concept of a population, in the sense of a resource with manpower implications, was not clearly stated until early in the seventeenth century, although discussion of the word had appeared in the writings of the French Roman Catholic prelate Nicole Oresme, the fourteenth-century popularizer of science.[18] Sir Francis Bacon was the first to use the term extensively and with its present meaning. A similarly empirical and quantitative approach toward the study of human resources characterized the political arithmetic of Sir William Petty, as expressed (1662) in his *Natural and Political Observations Upon Bills of Mortality.* Despite such noble auspices, however, continuing and effective concern with manpower analysis still lagged far behind the general study of, and speculation about, human populations at large.

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[17] The term "demography" is of course of much more recent origin. It was apparently used for the first time by A. Guillard in his *Eléments de statistique humaine ou démographie comparée* (Paris: Guillaumin, 1855).

[18] See Frédéric E. Godefroy, *Dictionnaire de l'ancienne langue francaise et de tous ses dialects* (Paris: Ministère de l'instruction publique, 1880-1892).

### *Industrialization: Transition and Trauma*

Western Europe's manpower problem at the beginning of the transition to an industrial society can perhaps be better understood if we employ hindsight to describe the four main components of the manpower reservoir.

1. A substantial part of the population was outside the work force because its members had chosen not to be a part of the active population and not to participate effectively in the production process. The contemporary literature characterized them as "vagrants," "the poor," "beggars." Since they were not inconsiderable in number, much of the new manpower policy, such as it was, directed itself toward attempts to draw them into the production process by "education" — i.e., either by creating in them a more favorable attitude toward work or by forcing them into the production process through the institution of workhouses. This "educational" policy was implemented on the basis of the state's police power and on the generally vague and pragmatic logic of centralized public administrations, rather than on careful factual information and analysis. At times, some sparse information was applied, but it was usually in the nature of an institutional management record rather than a manpower account. And very seldom was it useful in the placing of the "trainees."

2. The second most substantial component of the reservoir was made up of those who had provided the nucleus of the work force before the economic and social restructuring, and remained so after it, because their skills were still in demand. No policy decisions requiring information were, at least for the time being, involved here, and the necessary technological and economic readjustment was left to the members of the group and their employers.

3. A certain portion of the population had, in the breakup of the earlier social and economic order, lost its independence and economic place. These people were, of course, forced to look for new activities, and in the main were able to find them. But no arrangements existed at the time for even a rudimentary employment service (and certainly not job counseling or technological retraining). Unless these temporarily displaced persons elected to join the rapidly increasing armed forces or the burgeoning bureaucracy, they were apparently considered outside of a government's sphere of concern. A social welfare function, if any, was the responsibility, as in earlier times, of the church and its tangential organizations. This welfare function, although underpinned by personnel management records and accounts, never gave rise to anything remotely resembling manpower accounts or data.

4. Finally, there was the rapidly expanding part of the population that, as a consequence of recent population increase beyond the capacity of a given economy to absorb it, was gradually being pushed out of the work force. This truly excess population escaped identification for some time. The mercantilists were too preoccupied with manpower shortages and the benefits to be derived from

large populations to recognize the problem of an excess until it had reached the status of grave social pathology. Thomas Malthus was one of the first to see the problem clearly, but he was not concerned with social and manpower policy. His argument was simple — that poverty was necessary to keep fertility from becoming excessive.[19]

Concepts of manpower policy — as far as they existed at all — were vague and semiphilosophical, and thus did not call for elaborate empirical information. The first major impetus toward obtaining micro manpower information, rather than macro, came from those parts of the economic structure that still depended on slave and other unfree labor.

This was the sector to which the capital accounting concepts first put into practice by the merchants of north Italian cities were most directly applicable. But manpower accounting (in contrast to money accounting) was slow to develop at that time for several reasons: (1) the physical and socioeconomic distance of the slave sector from the cities where the money accounting first took root; (2) the usually stringent shortage of people familiar with the art of bookkeeping in all but a few urban centers; and (3) the tenacity with which agriculture, which was the predominant user of unfree labor, clung to tradition.

Slavery, in one form or another, had furnished a substantial part of manpower reservoirs since the earliest beginnings of Western civilization in Greece and Rome.[20] In the European economies of the Middle Ages and later, a slave had a twofold function: he served his owner as part of the work force on the estate, and he was hired out to others, for payment to his owner in kind or in money. From an owner's point of view, the slave was, in either function, comparable to capital goods that were the responsibility of the owner to acquire and maintain. Capital accounting methods, therefore, appeared suitable for recordkeeping on slaves. The bookkeeping approach was encouraged by the fact that the manors and monasteries, which (as noted earlier) were among the medieval enclaves that first used means-purpose oriented management methods, depended heavily on a work force of unfree labor. The information gathered, however, was primarily to serve the physical maintenance of this form of labor.[21] Thus it was comparable to information used by an army quartermaster rather than a recruiting officer. The accounting was in the tradition of the times — money accounting rather than manpower accounting. Nevertheless, these enclaves were producing the rudiments of a profit-oriented approach, i.e., weighing of costs against returns, despite the accounting difficulties introduced by the frequent and considerable fluctuations of the price of slaves.[22]

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[19] Thomas R. Malthus, *An Essay on the Principle of Population* (London: J. Johnson, 1803); see also Ralph Tomlinson, *Population Dynamics* (Random House, 1965).

[20] See M. I. Finley (ed.), *Slavery in Classical Antiquity* (Cambridge, England: Hoffer, 1961).

[21] E. H. Phelps Brown, *The Economics of Labor* (Yale University Press, 1962).

On the other hand, the existence of a system of slavery and other unfree labor was also one of the main obstacles to the development of a realistic job and labor market, which is one of the prerequisites of a rational manpower policy as we conceive of it. Only after the decline of the system did the development of "free labor" and hence of a relatively "free" labor and job market begin. The development was furthered by the impact of the problems created by the third and fourth components of the manpower reservoir (as listed above) — the technologically displaced, and the growing "excess" population. It was this market which provided the setting for many of our own contemporary approaches in manpower policy. In its own era it also furnished the framework within which much of the need for more precise manpower information would eventually be specified as well as satisfied.

In the meantime, neo-mercantilist and post-mercantilist society was caught in a rapid alternation of manpower goals, the result of swings from fear about manpower shortage to fear about manpower excess. For the first time there was a marked interest in systematic manpower information. The mercantilists' reliance on sizable armies and large populations called for information on manpower quantity, and their concern about balance of trade and labor productivity called for information on manpower quality. Not long before this time, one of the fathers of statistical demography stated that population was a god-ordained "exogenous" variable.[23] Now, however, political administrators were more and more addressing themselves to the population problem and what to do about it. In the preindustrial society of Europe, gross national product had expanded very little. Factors accounting for this lag included the rigidity of manpower supply in both quantity and quality; lack of population mobility; the difficulty of skill transfer from the active population to others; smallness of enterprises; excessive geographic specialization; and the absence of inter-geographic communications.

The mercantilists were in a more favorable position than their predecessors had been to recognize and diagnose some of these obstacles. In the eighteenth century's more receptive milieu for rational approaches and experiments with new methods and techniques, the development of a trained bureaucracy became possible. For the first time, there appeared administrators who had been indoctrinated through the academies of the "camera" in the more nearly rational rather than the purely political aspects of public administration. In the sphere of moral philosophy, the "Age of Enlightenment" had prepared the way for broad acceptance of rationalistic values and for a more nearly empirical attitude.

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[22] Max Weber, *The Theory of Social and Economic Organization* (The Free Press, 1964).

[23] Johann Peter Suessmilch, *Die göttliche Ordnung in den Veraenderungen des menschlichen Geschlechts* . . . (4th edition; Berlin: Buchhandlung der Realschule, 1775-1776), 3 vols.

This, then, was the period of incipient emphasis on economic intelligence, on foreign trade statistics, and on quantitative descriptions of both existing commerce and the young, evolving industries. Throughout, the carriers of this information function were the central governments, which as usual kept many of the results strictly confidential, for use only by the public administrators.

Manpower policies of the various nation-states were aimed at favoring immigration of skilled workers and deterring emigration. The tapestries of Fontainebleau, for example, were manned largely by workers from Flanders and Italy; the Prussian textile and glass industry created by Frederick II was made possible by importing skilled manpower from France. The policy had led to questions of industrial espionage, so that technical manpower became a major topic of diplomatic negotiations, and manpower information a matter for secret agents.[24]

As the "organic" manpower structure of the guild system continued to disintegrate, antagonism between employer and labor began to emerge. Since increasing output was eagerly desired by the nation-states, the early beginnings of what later became social policy favored the entrepreneur rather than the worker. In addition to broad economic statistics, these manpower goals required at least some information on the order of magnitude of the manpower reservoir. This period, therefore, also witnessed the first major population enumerations and vital statistics data systems.

The latter emerged from church records and were originally of documentary character, largely to satisfy administrative and legal requirements. Many of the recording requirements were set by the Tridentinum (the meeting of the Consilium in Trent in the middle of the sixteenth century) which clarified and codified much of the ecclesiastic law on marriage, with direct implications for the transfer of property in the law of inheritance. As time went on, these rudimentary vital statistics systems developed into viable population inventories (e.g., in Sweden under the law of 1748) that yielded valuable information on population totals and their demographic composition. But only later did some countries (for instance, the Netherlands) develop population registers also containing occupational information and other data directly relevant to manpower analysis.

### *The French Revolution and the "Free" Labor Market*

By the time of the French Revolution, which brought with it an emphasis on rational systems of measurement, the idea of regular and systematic population inventories began to reach the point of realization. Although the early censuses provided little manpower information in the narrower sense, they were the starting point for much of our own macro information on manpower. Largely head counts and straightforward population enumerations, they did not broach the more intricate question of the "economic characteristics" of the population.

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[24] Sombart, *op. cit.*, Vol. I, Part 2 (see our footnote 4 above).

One of the first attempts to develop the basis for a manpower inventory was made in France. A law of July 22, 1791, instructed the municipalities to establish an annual population register, which would include the name, age, birthplace, last residence, and also occupation "or other means of subsistence" of every resident.[25] This law is still the basis for French censuses, the first of which was conducted in 1801. However, detailed census instructions were not issued until the census of 1836, and not until 1841 were both residents and nonresidents enumerated.[26]

A number of other countries launched population censuses at the end of the eighteenth century and the beginning of the nineteenth. The Austrian *Konskriptionspatent* of October 25, 1804, for example, initiated population enumerations and was manpower-oriented, inasmuch as its main objective was associated with the military manpower problem.[27] Other early enumerations included those in Prussia and in several other German principalities, as well as in Sweden, Spain, Sicily, Savoy, and Nice.[28] Among the early systems of recurring censuses were the English (starting in 1801) and the French (also 1801). (The recurring census system in the United States is described in Chapter II).

Most of the early censuses contained little if any manpower information proper. The articulation of the occupational structure, for instance, was still rudimentary, and the number of known occupations was probably not much enlarged from the 450 listed in the Paris *register de Taille* of 1292. (It is interesting to note that the current edition of the U.S. Labor Department's *Dictionary of Occupational Titles* lists some 35,000.) The most serious manpower problems created by the industrial revolution could be easily cast in their general population context, and, in the main, economists of the time considered population theory an integral part of political economy.[29] The term "labor economics" did not yet exist, and manpower problems, as far as they were identified at all, were considered in the broader context of the socioeconomic structure as a whole. Demographers devoted their attention to the "quantitative processes of life and death" and the population census was the principal instrumentality to serve this end.[30]

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[25] M. Huber, H. Bunle, and F. Boverat, *La Population de la France* (Paris: Hachette, 1937).

[26] League of Nations Health Organization, *The Official Vital Statistics of the French Republic,* No. 9, Statistical Handbooks Series (Geneva, 1927).

[27] F. Zahn, in *Handwoerterbuch der Staatswissenschaften* (2nd edition; Jena: G. Fischer, 1890-1894).

[28] F. F. Linder, "World Demographic Data," in Philip M. Hauser and Otis Dudley Duncan, *The Study of Population* (University of Chicago Press, 1958).

[29] See, for example, Karl Marx, David Ricardo, and Adam Smith.

The development of an industrial system and the ensuing shifts in the economic structure of most West European countries very soon spotlighted the importance of knowing more about the work force and its composition. The breakdown of the early rigid corporate organization of occupations, the dissolution of slavery and serfdom systems, the rapid population expansion, and the city-ward migrations all fostered the appearance of "free" labor. Under the pressure of economic and social necessity, this free labor had to adjust itself to the new situation and had to seek and compete for jobs in the "free" labor market.

In earlier times, the law (or custom) governing the relation between employer and employee was based either on the Roman concept of property (e.g., the hiring and renting of slaves and unfree labor from their keepers) or on the Germanic concept of *Dienstrecht* ("pertaining to service"), which, similar to earlier family law, was patterned after the relation between servant and master. When the French Revolution introduced the obligatory relation between equals — a contractual concept according to which the employee exchanged his labor for the wage offered by the employer — the concept found such general acceptance that even the German Civil Code (which for many years represented the Central European counterpart of the Code Napoléon) expounds on its German equivalent in the chapter on obligations and indebtedness, together with purchase, contract of lease, and contract for work and labor. Thus the normative force of the new values, institutions, and technology also provided the legal framework within which the parties could meet freely in the labor and job market, exchanging skill for wages.

This new labor market permitted more flexibility in the relationship of the parties concerned, pressured recalcitrants into the work force, and gave the entrepreneur freedom to allocate manpower resources as he saw fit. It also compelled the entrepreneur to weigh carefully the effectiveness of labor inputs against costs. Consideration of skill and occupational aptitude became a foremost concern on both micro and macro levels. Thus, data on population quantity had to be supplemented by information on population quality.

When the question arose as to the best source of the appropriate macro information, the choice at that time fell on the population census. Contrary to earlier misgivings (for example, Swiss-French financier Necker, the great public administrator of the eighteenth century, had thought it impossible that a population enumeration could be undertaken successfully), censuses had established themselves as feasible and useful means for gathering quantitative macro information. Hence, by the middle of the nineteenth century, several nations began to experiment with censuses as a means for obtaining occupational characteristics of the population.

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[30] Frank Lorimer, "The Development of Demography," in Hauser and Duncan, *op. cit.* (see our footnote 28 above).

Austria included a question on occupation in the census of 1857; this was continued in 1869 and 1880; beginning in 1890 the operation was on a large scale. Belgium launched an industrial census in 1846, but did not begin deriving occupational information regularly from censuses until 1880. England's first census (1801) had included some occupational questions, but the procedure was not regularly established until 1881. Sweden included such items in the regular decennial census from 1860 on, and France began conducting special occupational surveys in connection with the population census in 1901. In Germany special occupational surveys were conducted in 1882, 1895, 1907, and at irregular intervals from then on. The Germans argued that special occupational surveys were preferable, because population censuses were most appropriately conducted in December, whereas it seemed better to ascertain the economic characteristics of the population in spring or early summer. (The influence of the still-entrenched agricultural sector is apparent in this reasoning.)

A good deal of attention was given to various technical aspects of occupational surveys, since procedures and schedules did not necessarily remain the same. For instance, the occupational classifications used in the Belgian census increased from the 241 of 1900 to over 400 by 1910. The concept of occupation also was modified in various ways. To avoid multiple counting, "occupation held" was supplanted by "belonging to a particular occupation" — and this foreshadowed the problem of establishing "usual" instead of "last" occupation. Similarily, family members were originally included in the breadwinners' occupational category; later they were identified *as* family members, permitting inclusion or exclusion from a given occupational group depending on the problem at hand.[31]

The concept of occupation as a qualifier of manpower has a long history. As discussed earlier, at its origination in medieval society its prevailing connotation was "calling" and "office," and it therefore applied to certain forms of activity only. Peasants, for example, although accounting for a very large portion of the population, were not considered members of an "occupation." Nor were they part of the corporate structure composed by the estates, the guilds, the Zuenfte and Ritterschaften. When this social order and its concept of "occupation" both dissolved, such strong emphasis was put on the new concept of relation between occupation and the income-creating aspects of gainful employment that major parts of the working force — for example, housewives — were completely excluded from statistical treatment of manpower as a natural resource.

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[31] For occupational information from more recent censuses, see *United Nations Demographic Yearbook, 1948*, Table 12; *1956*, Table 16; *1964*, Tables 10 and 13.

Whereas in the disappearing order, occupation (*Beruf*, profession) was sharply defined — the doctor and the barber, the cabinetmaker and the silversmith — the "gainful occupation" concept of the emerging industrial society was not. Thus, occupation, once a universal social category implying both a man's position in society and his "calling," became a pragmatic qualifier of manpower, indicative of the kind of economic activity to which a member of the work force belonged.[32] However, in the rapidly expanding and changing socioeconomic situation, "activity" in this simple sense soon ceased to be a satisfactory and sufficient identifier. The character of the specific enterprise within the general economic sector became relevant, because, for instance, the occupational characteristics of a carpenter in a machine-tooling plant differ from those of a carpenter in a furniture factory.

The development of the new manpower qualifiers was slow and gradual, and is still far from completed. (Even today remnants of the old order can be found side by side with the new: i.e., some of the professions and their societies and some of the highly skilled workers and their unions.) The manpower policies and decisions that resulted from the changing identifiers were themselves being steadily refashioned by other changes in social, economic, and technological systems, and the needed supply of information only hesitatingly kept pace.

Today, as manpower policies are becoming more ambitious and pervasive, the decision makers are realizing that the concept of "occupation" in the modern industrial world has become enormously complex and multi-dimensional. Our contemporary sociology (largely influenced by German sociologist Georg Simmel) considers occupation (1) a fundamental sociological category with a technological content (specific operations and skills involved), (2) an economic category (income aspect), and (3) a socio-psychological category, not necessarily consistent with either of the other two.[33]

Although there was little (if any) reported coordination of technical activity among nations during the early period of collecting occupational information, several emerging problems related to taxonomy later led to international exchange. Some of the problems encountered were not very different from those that face us today. The vexing conceptual issue so often present in work on socioeconomic fields was evidenced at that time by the obvious search for words in everyday usage that would express the concepts to be applied to the collection and analysis of occupational and manpower data. There was also evidence that new policy problems kept arising that were far from simple and not entirely understood even as problems. In other words, for the first time in the history of attempts to collect manpower and population information, there were questions for which neither precedent nor obvious answers existed. (It was not the last time, however; in many respects we are still groping today.)

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[32] Zahn, *op. cit.*, pp. 254 ff. (see our footnote 27 above).

[33] Salz, *op. cit.*, (see our footnote 15 above).

Since the new social order in general equated "occupation" with "gainful activity," a problem to be faced was the basis on which occupation should be assigned to a given person. Where several occupations were involved, the German system found it natural to use as a classifier the gainful activity which counted for the largest part of a person's income. In Switzerland, the decision was based on time spent.

Other puzzles that were tentatively recognized involved the question of primary and secondary occupation, and the long-debated question of whether an unoccupied family member who derived his sustenance from the breadwinner's income was an "active" or "passive" member of the breadwinner's occupation. Though such problems were discussed, they did not become explicit objects for careful, logical, and technical consideration until much later. When this did happen, it was often the result of international conference discussions.

Uppermost, of course, were the problems of occupational taxaonomy. Conceptually, the early approaches and practices in this area were far from clear. The final solutions were arrived at by a long process of trial and error and with much vacillation. Part of the difficulty was due to the fact that the agricultural sector still dominated much of economic and political thought. The new nonagricultural industries, which had captured the interest of early economists, were slow to develop, partly because their main growth impetus — technological innovation — tended to be highly selective, i.e., centered on a few products and groups of products.

The early occupational classifications reflected mainly the historical experience in this or that country and were limited to such broad groupings as agriculture, mining, manufacturing, and business. Although the groupings were usually not manpower oriented, they did provide a convenient and more or less automatic classifier of occupations. The resulting information seemed to have satisfied most decision requirements for broad economic policy and its minor adjunct at that time, manpower policy proper. Determination of occupational characteristics was left primarily to the marketplace. The relation between the size of the skilled and highly-skilled active population and the number of jobs requiring such specialized manpower was apparently not as yet important enough to be of concern to public policy makers.

## *The Era of Social Policy*

The situation changed radically as repeated economic crises created sharp and painful economic and social reaction, threatening the very consensus of society. This reaction brought about the birth hour not only of social policy as a major governmental concern but also of very specific interest in the economic characteristics of the population.

Two salient developments followed (although not in as swift or organized fashion as their mention here implies) that produced not only their own information requirements but also their own information-generating systems: (1) governments began to enter the business of matching jobs and men; (2) governments began to insure the nation's work forces against the vagaries of major income fluctuations — that is, against certain risks for which a government was willing to assume responsibility. Forerunners for these beginnings of what we now term government employment service and social insurance can be found in Europe's past, but as going concerns both were inventions of the late nineteenth century.

When the "free" labor market made employment the concern of individual employers and employees or, in some instances, of voluntary organizations, pertinent information needed to match men and jobs had to be acquired somehow. The modes of access to such information and the kind of data collected for it had evolved from custom and historical accident rather than from deliberate specification and planning. Little attention, if any, had so far been given to coordination of information content and information channels. Nevertheless, this period was the starting point of the subsequent concerted attack on the manpower information problem.

The first public employment services were founded mostly on a communal basis and their information requirements were relatively primitive because of their geographic restriction; early examples of such services were those of Bern (initiated, 1888), Basel (1885), and Stuttgart and Munich (1895). The first idea for a national employment service system can be traced (as can the beginnings of various types of social insurance) to the Germany of Chancellor Bismark, which, even as an Empire, never quite outgrew the acceptance of mercantilist values and instrumentalities. Bismark, himself, was the advocate of many economic and social reforms. In 1896, although no longer Chancellor, he issued a circular strongly recommending a centralized employment service. If nothing else, this stimulated the outcrop of a great many local services in most German cities, each with its own uncoordinated recordkeeping practices. No provision was made for systematic interoffice clearance of information or records. The first national employment service system was established by the law of June 2, 1910 *(Stellenvermittlungsgesetz)*. It furnished only a general regulatory framework for employment services throughout Germany and did not deal in particular with a national employment service. What centralization there was took place in the form of a voluntary federation of employment services *(Verband Deutscher Arbeitsnachweise)*.

The British employment service was conceived from its beginning as a national system. Originally established within the Board of Trade (the Labor Exchange Act of September 20, 1909), it later (1917) was moved into the Ministry of Labor. From its inception centralized in London, it was administered through eleven divisional organizations. The functions soon expanded beyond the initial labor market function. This happened when the system of so-called labor exchanges (after 1916 the term was employment exchanges) was assigned the administration of unemployment insurance. The corresponding expansion of jurisdiction, (which was later to exert a deep influence on the social insurance system of the United States) impeded and altered the labor market function of the British service for many years to come, but it also resulted in the generation of much operating information bearing on manpower problems. Although not specifically designed to serve manpower at large, these operating and by-product data became one of the richest sources of manpower information.

Soon after the establishment of the service in 1909, the reporting of vacancy data was systematized by feeding local records into the eleven divisional organizations, and from them into a national clearinghouse. Although this flow of information was limited to what today would be termed "difficult to fill" vacancies, it was the origin of a much-needed information source on the demand for manpower.

In France, the idea of employment exchanges can be traced back to the period of the French Revolution. However, the *bourses de travail* of the late nineteenth century were not fully governmental organizations; rather, they were free employment bureaus that functioned in close cooperation with labor unions. First established in Paris (1887), they rapidly grew in number; five years later there were fourteen, but they continued to resemble municipal or district federations of labor unions rather than a public employment service. During their ensuing involvement in political struggles (the syndicalist issue), they soon lost most of their original function and hence their importance as generators of employment information. A truly national employment service was developed in France only after World War I, although individual offices had begun to emerge during the war. From the information point of view, it should be noted that the new national service was based on a system of offices which were highly sectionalized by major occupational categories. Therefore, many of the data flowing from the operations of this service had built-in occupational qualifiers.

Social insurance was another of the components of nineteenth-century socioeconomic and manpower policy that would eventually generate a massive flow of information. As noted earlier, the first plan for a going concern was a product of the highly centralized German Empire, and was advocated by Bismark. Initiated by an imperial message of Wilhelm I (November 1871), it was finally embodied in the sickness insurance law of 1885. Analagous legislation soon followed to cover accident, old-age, and invalid insurance.

Although such systems were not necessarily insurance in the sense of actuarial mathematics, their affinity with actuarial science was sufficiently pronounced to make the inclusion of more nearly quantitative and empirical approaches appear reasonable and desirable. From its initiation, this instrument of social policy relied heavily on administrative procedures requiring a good deal of manpower information. Although the basic problem was neither novel nor unique, the sheer order of magnitude of administrative decisions pointed toward the need for highly rational methods. The necessity to estimate loads, expected revenues, and expenditures and to forecast incidence of risk — continuously and accurately — called for the development of appropriate (and sophisticated) accounting methods.

Thus, manpower information, which had for so long been a matter of only vague social concern, suddenly became a major necessity as a foundation for one of government's most spectacular financial operations — the social insurance system. The system at first applied only to part of the manpower resources, but in each country that initiated it the coverage soon expanded in both numbers of persons and numbers of events.

Attempts to meet the need for appropriate information included the creation of central statistical offices as a step toward eventual development of a complete economic intelligence system. By the end of the nineteenth century, most of the important European countries possessed a basis for official manpower statistics systems, but full development of the facilities and their intensive use did not begin to occur until the twentieth century. One reason for the lag may have been the relative backwardness of the analytical tools in use for the exploitation of manpower statistics. This mediocrity of the state-of-the-art quite possibly was furthered by the extreme modesty of the demands that economists, social scientists, and officials had made over the years for empirical underpinning and verification of their concepts and practices. For example, although England was the birthplace of European economics, the British economists of the late eighteenth century concentrated on theory and axiomatics, leaving little room for empirical approaches. Even during the second half of the nineteenth century, following the emergence of the mathematical school of economists, interest was usually directed to the formulation of models and generally postulated relationships. With some exceptions (for example, Pareto's inquiries into the income distribution), the social scientists were not directing their attention toward the use of observational data. And the historical economists of the continent were more devoted to the philosophy of economic history and to the broad outlines of a suspected socioeconomic development pattern than to the careful unearthing and piecing together of historical fact.

Labor economics as an autonomous field still did not exist. When it did appear, it would have roots reaching back to a number of distinguished thinkers and innovators, whose contributions were made in various ways during the last of the eighteenth century and throughout the nineteenth, when the sore need for such approaches was evidenced. Among these contributors were Thomas Malthus (1766-1834) and Adolphe Quételet (1796-1874).

Malthus (political economist and also a curate of the Church of England) was deservedly marked as an innovator by the heated controversy triggered in 1798 by the publication of his pamphlet, *An Essay on the Principle of Population as it affects the Future Improvement of Society, with Remarks on the Speculation of Mr. Godwin, M. Cordorcet, and other Writers.* The work was later referred to by English economist Alfred Marshall as "the first thorough application of the inductive method to social science." However, most manpower analysts of our own day see the pamphlet as what Malthus obviously intended it to be: a forceful polemic against the concepts of William Godwin and other Utopians (as detailed in Godwin's book published in 1793, *An Enquiry concerning the Principles of Political Justice and its influence on General Virtue and Happiness*). To counter the Utopians' much publicized belief in the possibility of the "perfect" society — free of war, crime, disease, government, and with a 30-minute working day — Malthus bluntly emphasized some of the harder facts of life. Although his brief was well buttressed with figures from a variety of sources, his mood was perhaps not much less emotional and speculative than that of the Utopians. But his charge was a courageous onslaught against a prevailing intellectual fashion.[34]

Probably the most outstanding early advocate and practitioner of both the search into the invariance of certain mass phenomena and the use of statistical methods in the study of man was Belgian astronomer Adolphe Quételet, who had been a student of the great teacher of probability, the Marquis de Laplace.[35] Any history of quantitative manpower analysis should begin with Quételet, even though he did not study manpower problems as we understand them today.

To him ought to go the credit for attempting to fuse scientific method with the study of social events. In so doing, he realized (and emphasized) the great importance of adequate empirical data. He was the main planner not only of the first Belgian population census (especially important for its emphasis on stricter methods of data collecting) but also (1841) of a central statistical and policy planning commission which he served as its first president.[36] An exponent of what is today called the interdepartmental approach to social phenomena, he also deeply influenced the early development of techniques for aptitude, mental trait, and skill measurements that are so important in modern manpower analysis. Although his original enthusiasm for the "normal law" as a general model for the distribution of social variables was later to be mitigated, his importance to the statistification of the study of man can hardly be exaggerated. He also helped to set the stage for the role that factualism would play, for better or worse, in the social sciences and particularly in manpower research and policy.[37] As a member of the American Statistical Association from its beginning, Quételet influenced the early development of American educational statistics, as illustrated by the educational studies of Bowditch and Porter.[38]

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[34] For a more nearly scientific example of quantitative analysis as applied to population, one must look at another and earlier stream of thought, as exemplified by English statistician John Graunt (1620-1674), in his *Natural and Political Observations . . . Made Upon the Bills of Morality* (London: 1661-1662; reprinted by Johns Hopkins University Press, 1939). A charter member of the Royal Society, Graunt was one of the first searchers to apply careful quantitative patterns of thought to a population phenomenon. He and his followers were fascinated with the discovery of relatively stable patterns in human population (and, later, in animal populations). Although the application of his approach was to the field of insurance, the techniques and methods developed thereby were directly pertinent to manpower analysis in the narrower sense — for example, in the construction of working life tables.

[35] See Nicola E. Mailly, in *Annuaire de l'académie royale des sciences, des lettres et des beaux-arts de Belgique* (Brussels, 1875), Vol. XLI, pp. 109 ff.

However, the great promise for manpower analysis inherent in this kind of statistical approach was not fulfilled at that time. The studies of Sir Francis Galton (1822-1911), Karl and Egon Pearson, and their followers turned the mainstream of statistics toward the fields of anthropometry, genetics, and biometrics. Only recently have some manpower analysts discovered that parts of the impressive statistical arsenal developed by the Galton group are relevant to their own wares.

## *Government's Statistical Information Function*

### *Statistics in General*

As noted earlier, the launching of social insurance systems in the late nineteenth century generated the creation of administrative machinery for the collection of quantitative information. Central statistical offices and assortments of decentralized data collecting agencies were set up in most of the industrialized countries. However, even when a government did provide a central focus for government statistics, some of the information was still being collected or accrued as a by-product of administrative activity. Thus, the most that can be said about the actual centralization of statistical data is more (e.g., Germany) or less

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[36] See August Meitzen, *History, Theory, and Technique of Statistics* (Philadelphia: American Academy of Political and Social Science, 1891).

[37] Adolphe Quételet, *Physique sociale: ou sur le développement des facultés de l'homme.* (Brussels: Murquardt, 1869).

[38] See W. Townsend Porter, "Application to Individual School Children of Mean Values Derived from Anthropological Measurements by the Generalizing Method," in *Papers in Anthropometry* (Boston, 1894) and H. P. Bowditch, "The Growth of Children," in *Report of the Board of Health of Massachusetts* (Boston, 1877) as quoted by Helen Walker in *Studies of the History of Statistical Method* (Baltimore: Williams and Wilkins, 1931), p. 41.

(e.g., Great Britain). In no country at that time was there to be found a systems-oriented statistical production, either through organizational centralization or through systematic coordination. Information other than the strictly demographic (which was usually centralized in a census bureau, or a statistical office) was as a rule distributed over a multitude of agencies, foremost among which were those concerned with industry and commerce, agriculture, and (later) labor. In Great Britain, where decentralization was pushed farthest, manpower data could be found in the reports of customs offices (on emigrants), in the Home Office (on aliens), in the Customs and Excise Department (on old age pensioners), in local government boards (on "paupers"), in the Board of Trade (on manufacturing industries and on unemployment insurance — extremely important sources of manpower data), and doubtless in a number of other agencies.

In Germany, a Central Statistical Office *(Statistisches Reichsamt)* was established in 1872, only a few months after the emergence of the German Empire. Most of the compilation of manpower data was undertaken by the Division of Labor Statistics in this office, even though the data emanated from a variety of agencies and organizations. Even here, however, a number of more-or-less autonomous state agencies and municipal offices provided occasional manpower data (e.g., the annual employment data furnished by the state agencies of Saxony).

The early functions of France's central statistical agency were obscured by the turmoil of the Revolution and by the frequent post-Revolution administrative changes. We know, however, that Antoine Lavoisier (best known as one of the founders of modern chemistry) was commissioned by the revolutionary government to collect the data needed to carry out proposed administrative and fiscal reforms, which presumably included the establishment of such a central office. And, although not directly relevant to manpower statistics, his *Apercu de la richesse territoriales et des revenues de la France* (published in 1790) was one of the milestones in the development of official statistics. (After having served the revolutionary government in such distinguished fashion, Lavoisier was executed in 1794, during the "Reign of Terror.")

In any case, records show that the Service de la Statistique Générale de France was in existence in 1801. It was suppressed in the reorganization of 1812, and not reactivated until 1833. Although subject to frequent organizational modifications, it continued its operation throughout the rest of the nineteenth century and into the twentieth. It was one of the primary sources of population data from the quinquennial census and of manpower information, as it gradually developed for the census schedules more and more elaborate questions on the economic characteristics of the population. Although the French service was more nearly centralized than, say, Great Britain's, manpower information was also collected by the Bureau of the Ministry of Labor and

Social Welfare, which was created in 1906; beginning in 1910, the Statistique Générale became a subordinate part of this Bureau.

Belgium's General Statistical Bureau was organized (February 1831) in the Ministry of the Interior. In 1841, to reinforce systematic coordination of government statistics, a central statistical and policy planning commission was organized, also in the Ministry of the Interior. The commission had wide powers regarding publication plans for government statistics. It also greatly benefited from its first president, Adolphe Quételet, who not only brought it the prestige of his name but also the enthusiasm of one of the greatest "statistifiers" of the social sciences. Quételet was also instrumental in introducing the first Belgian industrial census (1846), which was designed to obtain a good deal of manpower information. A similar one was taken in 1866, but the data were never published. The first published follow-up came in 1880, and, starting with 1896, such surveys were made every ten years. From the 1846 beginning, the surveys elicited an unusual amount of data, and the coverage was gradually extended to all industries and trades. The whole effort provided an example for occupational censuses and for the development of occupational and industrial classifications that could be (and was) followed elsewhere.

However, at the time, the 1846 census was an exception (just as Quételet was himself an exception) to the trend that persisted through a good part of the nineteenth century. Even though most of the countries in Europe had developed an administrative framework in one form or another for organized data production, little analytical use was made of it for generating manpower information, even after concern about such information had increased. A fairly large amount of the data collected on manufacturing and commerce, foreign trade, customs, and fiscal aspects of the national economy found its way for policy examination into the analytical workshops of the universities, and even into those (such as they were) of government agency staffs.

For manpower policy, however, since the beginning of the nineteenth century the assumption had been made more consistently than for any other field of economic policy that the market mechanism would take care of the more urgent problems. Only in the still patriarchal milieu of Central Europe did state intervention explicitly include manpower. But even there, as shown by Bismarck's legislative program for the new German Empire, the motivation had little to do with the need to establish a viable manpower policy as one of the facets of national economic policy. It was predominantly political — to "pacify" the masses and to prevent the ascendance of the Social Democrats.

A similar trend was evident in other parts of Europe. Under the influence of Marxism and other movements with manpower ideas that were essentially political in content, manpower policy was primarily oriented to counteract some of the social pathologies generated by the Industrial Revolution. Thus, protective labor legislation (including children and women labor laws) and legislation aimed at other forms of social ideologies very nearly pre-empted the entire domain of policy decision that should also have included major manpower policy.

The study of political economy had begun to move toward economic analysis, but only very slowly, and mainly in regard to problems of foreign trade, investment, and the commodity market mechanism. Very few serious efforts were aimed at a better understanding of the manpower problem. As far as the problem was identified at all, it was usually lumped with the problems of the currently emerging social sciences, which were surrounded by an aura largely literary and emotional. For such approaches, manpower information requirements were minimal, and could be satisfied by institutional types of description. This situation was only slightly altered by the emergence of early trade unionism, partly because most of the literature at the time was contributed by writers who had been trained in law or in public administration.

Conditions in regard to the knowledge of statistical method were similar to those, a few centuries earlier, concerning the "art of reckoning," when an illiteracy in arithmetic had been one of the serious obstacles to the introduction of accounting methods. Now a corresponding illiteracy in statistical techniques was one of the serious bottlenecks in the application of analytical methods to problems of national policy and public management. In some fields, statistical methodology had established itself by the end of the nineteenth century; of these, several were not unrelated to manpower analysis. For instance, actuarial science, physical anthropology, genetics, and eugenics had, from their beginning, a strong statistical flavor, and some of the famous early statisticians and probability theorists had applied such methods to them and to related research fields. Among the early leaders in this respect was F.Y. Edgeworth, the first editor of the British *Economic Journal.* But most students of manpower problems were very slow to familiarize themselves with this kind of methodology; "statistics" to them meant primarily descriptive data. The tradition of Gottfried Achenwall, the reputed coiner of the term "statistics" in the eighteenth century, and of the German "table makers" had been very tenacious among government statisticians in general, and among those concerned with manpower and labor problems in particular.

The historical school proceeded along descriptive lines, and the quantitative theorists (e.g., Cournot, Jevons, and Walras) were mathematical economists not particularly given to inference from empirical data. Demographers by that time had developed their own discipline, and centered it around problems other than manpower. Manpower therefore fell in between the many chairs on which it might have sat comfortably, and the only explanation for this fact seems to be historical accident.

### *Manpower Statistics in Particular*

The situation began to change during the early part of the twentieth century and especially during the period between World War I and II. Perhaps the most influential factors were (1) the increasingly serious impact of business cycle crises from the end of the nineteenth century on; (2) the ensuing unemployment with its many social and political ramifications; and (3) the grave and complex manpower problems during and after World War I, which were especially difficult for the economies of the defeated nations to contend with.

The manpower problems created by the business crises were particularly serious because of the income-destroying effect and the social implications of economic depressions. Therefore, much of the manpower policy that was rushed into the breach was directed toward income maintenance. Wage and hour information became quite as important as manpower information in its narrower sense. And many of the ensuing discussions and new instrumentalities were directed toward achieving for labor a "fair" and reasonably stable share in the national output. This, then, was the period of such innovations as collective bargaining and anti-unemployment measures. The latter, however, were often repressive rather than preventive.

A compulsory unemployment insurance scheme was initiated in Great Britain in 1911. After World War I, similar programs were introduced in Austria (1920) and in Germany (1927). Despite their initially limited coverage (less than 15 percent of the gainfully occupied in Great Britain, under 40 percent in Austria, and about 50 percent in Germany), they produced an unprecedented wealth of statistical information. However, where restricted systems existed — e.g., the "Ghent system," in some West European countries, which was limited to trade union members and frequently on a voluntary basis — the information which resulted was not especially useful.

In Germany the manpower problem created by World War I was of a different nature. Here the issue became how to channel returning servicemen and others into an economy which had to be recast into a peace economy. The main chosen means was a greatly expanded public employment service to revive the almost nonexistent free labor market. This policy was directly oriented toward manpower as an input, and income maintenance and other social objectives were not the primary objectives.

From the beginning of the war there had been a growing manpower shortage; the problem was accentuated toward the end of the war. In 1914 a central employment service had been created in a hurry, without adequate provision for badly needed information necessary to match men and jobs. During the years of the war, much of the jurisdiction of the employment activity passed into the hands of the military. Employment service districts were made to coincide with army corps areas, and all applications and vacancies had to be reported to a central bureau. In 1918, the apparatus was transferred to the civilian administration of the demobilization agencies; compulsory reporting was maintained and the overall reporting scheme expanded.

Thus, the German system was probably the most completely compulsory one in the West; it became the base for the postwar development of the central employment service, which, in 1920, was established in the Ministry of Labor. The 1922 employment service law gave the agency the right to demand information on labor conditions and to conduct surveys requiring compulsory response. The law mentioned explicitly that such factors as physical and mental capabilities of applicants were to be considered, hence ascertained; it also established that employers were obliged to report vacancies, except in agriculture, small firms (less than five employees), and home industries.

This was probably the most comprehensive system in Western Europe at that time for providing mandatory information on the labor market, on applicants, and on vacancies. It was later superseded by a more relaxed and elastic organization, a self-governing agency that administered, as was the case in many other countries, both employment service and unemployment insurance. Hence, social considerations and policies oriented to income maintenance again had become the dominating motive, to the disadvantage of the essential function of matching jobs with men.

Two other activities of the time should be mentioned here within the context of the labor market function of public manpower policies. Both were related to the gradually expanding awareness that quality of manpower was a critical characteristic, if labor were being considered primarily as a production input. The first was oriented toward training and education, the second toward appraisal and evaluation of a person's aptitudes and skills, in view of his expected role in the labor market. The first soon became an important source of manpower information; the second was less so, for reasons discussed later.

Most of the earliest training schemes that had any quantitative impact at all were centered around the very ancient institution of apprenticeship. The importance of the medieval universities and academies as suppliers of manpower was not great. And the traditional in-the-family training, whereby skills and trade secrets were passed from father to son was a tangential form of apprenticeship, but of uneven and hard-to-measure quality.

As a device for careful training (or perhaps overtraining) apprenticeship was a most effective means for the teaching of skills, especially where the technology was, as in early times, primarily empirical and therefore did not lend itself readily to any other form of instruction or communication. The institutional framework within which this qualification of manpower was most frequently undertaken in early Europe was provided by the guilds. During the classical period of the guild system, the training device produced manpower of the highest caliber. But as the guilds themselves gradually became protective devices to enhance the monopoly of masters, apprenticeship became more and more a means for providing cheap labor and for taking care of the children of the "poor."

With the repeal in 1814 of the statute of artificers in Great Britain, apprenticeship lost much of its importance and survived to any extent only in those parts of Europe where patriarchal, organicistic forms endured longest — primarily Germany and Austria. Even here, however, its manpower information-generating function was minimal.

In the meantime, elaborate systems of education and training in the "middle" schools and in trade and engineering institutions had begun to emerge. The trade schools of the continent, particularly in Germany and France, constituted the outstanding early attempt to provide training facilities as a substitute for the disintegrating apprentice system. In the eighteenth century, Prussian kings Frederick William and Frederick the Great were actively interested in the promotion of such schools; in France, the encyclopedists stressed the importance of what today would be called vocational education on the high school level.

In the nineteenth century, governments began to take an acute interest in all forms of education. Early in the century, the Prussian schools and universities were transferred to the jurisdiction of government agencies, and this movement toward national supervision soon spread to other countries on the continent. The system, involving newly formed ministries and departments of education, created a possible new source of certain kinds of manpower information. And when compulsory school attendance became more and more the rule, the educational system emerged as an outstanding information source, in particular on some of the qualitative aspects of the manpower reservoir. Although much of the information was for fiscal, budgetary, and administrative purposes, its availability seems to have stimulated inquiries into (1) the factors underlying aptitude and skill; (2) problems of test and measurement; and (3) the relationship between training and/or education on one hand, and performance on the other.

These inquiries were closely associated with the second activity — appraisal and evaluation of aptitudes and skills — that (as noted above) was related to the new awareness of the critical importance of manpower quality in relation to the new industrial system. In the nineteenth century, the activity first took the form of what we would term vocational guidance and counseling. It was designed to fill the vacuum created by the dissolution of traditional patterns which had governed entrance into the occupational world, such as the guilds and the father-to-son relationship.

Roots of the new activity can of course be found during earlier centuries, but its practice in the nineteenth century had an objective that was directly related to the new manpower demands of the industrial situation. In the main, it was aimed at new entrants into the labor force — and, even more specifically, at women and juveniles who were interested in the newer crafts and duties which permitted no parallel to apprenticeship. Therefore, the information-generating impact of occupational counseling was, for years to come, limited to juveniles and women.

The counseling function was originally assumed mainly by religious, charitable, and other private or semi-official organizations (well-exemplified by activities in Basel, 1910, and later in Berne).[39] In Germany, official recognition of the need for occupational counseling came with the spectacular dislocation of the labor market at the end of World War I. A famous ordinance of the Office of Economic Demobilization (November 9, 1918) created occupational offices *(Berufsaemter)* whose statutory functions were vocational guidance and the supervision of training and employment of apprentices. At first, the jurisdiction of the offices was left to the several states, a tactic that resulted in a very clumsy system. In 1922, the system was centralized and attached to the public employment service; hence, occupational counseling was undertaken primarily with a view to immediate labor market needs, based on the requirements of the employment service. Most of the counseling was done in close cooperation with the schools. This arrangement presented no major administrative difficulties, since the schools were under the direct supervision and management of another central government agency, the Ministry of Education.

Such counseling is, however, a delicate and subtle matter, and at that time there was little previous experience with it. Thus, information was obtained through rather amateurish questionnaires, and much of the actual counseling was based on the personal experience and views of the interviewing official, frequently a teacher who discussed the problem with the juvenile in the presence of his parents.

In the early 1920's France made some provisions for such counseling within the system of the public employment services. In 1928, however, the Institut National d'Orientation Professionelle was created, and under its influence the counseling system took a turn toward better organization. In Great Britain the activity, (more or less centered in the Ministry of Labor) proceeded along "empirical" lines through the informal services of advisory committees. Only much later was this casual approach modified, and largely because of the creation of the National Institute of Industrial Psychology.

The early effect of these efforts on the generation of information and on its analysis was not very marked, to say the least. But they were the antecedents of much more serious efforts — most of them very recent and largely due to new developments in theoretical and applied psychology.

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[39] Described in *Soziale Praxis* (Berlin and Leipzig), Vol. 31 (July 12, 1922).

The period after World War I and the later worldwide depression of the 1930's saw drastic and confusing alternation of severe manpower shortages, manpower demobilization problems, and then, during the depression years, the all-disrupting manpower excess. National socialism and communism were among the more emotional and violent manifestations of the discontent with the prevailing order. Yet, throughout most of the period, approaches to manpower problems had remained unsophisticated, largely because the data necessary to adequate policy making were still sadly lacking. However, the atmosphere of crisis finally did produce in most of the West European countries a deeply felt need for more rational and specifically applied manpower policies.

The urgency of getting a clear view of the manpower picture, which had been partially obscured for centuries throughout the many and profound changes of the post-medieval socioeconomic structure, generated a rapid increase in the volume of manpower data. (Thus, the long lag of manpower economics behind the other components of national economic systems was finally being decreased.) Although the "facts" collected were not always the most pertinent, a spectacular expansion of the manpower information base did take place. The administrative framework for macro data had of course been available for many years in the official statistical agencies of most Western countries, but the character of that information now needed to be changed to keep pace with the new emphasis on the supply of and demand for manpower in the labor market. The role played by earlier protective (and selective) labor policies (which, for example, generated so much legislation to protect working children and women) would soon be overshadowed by more comprehensive policies based on the concept of manpower as a precious national resource. The mercantilists' earlier notion of the importance of resources for the existence of the nation-state was reaffirmed at this time, but with the recognition of the importance of facts and information as an additional resource.

Thus, in 1927, only a few generations after mercantilism had been the fashion, a German law provided for quarterly tabulations of statistics on the labor force. A system of files, maintained through a nationally centralized scheme of labor offices, provided separate coverage of vacancies; the employed (grouped into thirty-four occupations and seventy-two branches of industrial activity); the unemployed; and jobseekers. Job counseling offices provided current information on new young entrants into the labor force. A second and also nationwide source for manpower data was the unemployment insurance system, which gathered information on the unemployed and on those employed in emergency and relief work. In addition, monthly surveys of establishments with ten or more employees produced special data on that part of the active population. The population census was expanded to include data on the self-employed and on family workers.

The British system, though simpler, has been no less comprehensive. The main source of information was the Social Security Administration which, since 1948, had covered practically the entire population. In addition, quarterly establishment surveys (of those employing ten or more persons) were conducted by the Ministry of Labour. In France, quarterly establishment surveys of selected industries, covering about a third of the active population, provided current manpower data. In addition, the unemployment insurance system, through local labor offices, collected information on jobseekers who, at least in theory, had the obligation to report regularly to the labor offices. Sweden has conducted quinquennial censuses that were supplemented by annual industry surveys of establishments employing five or more persons, albeit only of those which have agreed to cooperate.

In sum, the devices that were used for the accelerated collection of manpower information included: direct inquiry on an establishment basis (for example, in Austria, Czechoslovakia, Denmark, France, Germany, Great Britain, the Netherlands, Norway, Switzerland); recurrent population surveys (for example, in Canada, Denmark, France); operating data accruing in the administration of social security and public employment service systems and in some instances also from trade union records (Australia, Belgium, Canada, Great Britain, Norway, and Sweden). Despite a number of deficiencies, the resulting information certainly marked a substantial step forward, but possibly more in quantity than in analytical significance.

Soon after the end of World War II, considerable interest developed in collecting comparative information, with a view to shaping national manpower policies within a reference frame of comparative manpower potentials. The International Labor Office (ILO), in existence since 1919 and equipped with a statistical division, was one of the first vehicles for this endeavor. During the interwar period, ILO had been mainly concerned with conventional labor statistics — i.e., cost of living studies, trade union statistics, wages, and collective bargaining. It now became a welcome entrant to manpower study.

The sessions of the 1947 Conference of Labor Statisticians (held in Montreal) were primarily devoted to hammering out manpower concepts and definitions. The work centered around difficult taxonomic problems, in the hope of finally creating a well-defined and universal terminology for such concepts as civilian labor force, total labor force, employed persons, paid worker for public or private employer, own account worker not employing others, unpaid family worker, trainee and apprentice, and unemployed persons.[40]

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[40] See ILO, *The Sixth International Conference of Labor Statisticians* (Geneva, 1948); and ILO, *Employment, Unemployment, and Labor Force Statistics: A Study of Methods* (Geneva, 1949).

However, when the problem of unification of manpower statistics became pressing after the introduction of the Marshall Plan, a Commission of the Organization for European Economic Cooperation (OEEC), chaired by a leading ILO statistician, came to the conclusion that terminological unification of manpower information would not be appropriate. The great diversity of information needs as evidenced at that time by a number of Western countries made it impossible to bridge the gap between national requirements and international comparability.

Curiously, no such difficulties have usually been encountered in the standardization of other economic statistics. This frustration in regard to manpower information, at the midpoint of the twentieth century, spotlighted again the continuing lack of articulate, well-reasoned patterns of manpower analysis. However, it also suggested that the lack might eventually be reduced if the deep-rooted nation-to-nation idiosyncrasies and the consequent parochial approaches to such problems could be overcome.

# II. The U.S. Story: A Synopsis

## *Colonial America and Its Growing Pains*

During the eighteenth century and early nineteenth, the United States of America was, despite its political breakaway from Europe, still influenced by many European institutions and patterns of thought. Its early economic structure, however, differed too widely from Europe's at that time to permit a simple, semiautomatic transfer of experience in that sector. England and the continent were already industrializing, whereas the North American economy was, to say the least, still underdeveloped. The difference was most pronounced in regard to the new country's early manpower sources — and hence to manpower problems.

In contrast to the practice of European colonists in other parts of the world, settlers in that part of the Western Hemisphere which eventually became the United States (and Canada) were rarely able to press the "natives" into agricultural or any other service. Therefore, as the colonial agricultural economy began to demand manpower, especially for the plantations in the South, importation of "foreign" labor in the form of slaves from Africa seemed the easiest solution.

The first shipload of slaves arrived in the Colony of Virginia in 1619. After that, since the slave trade, as carried on by navigators from nearly all European countries (following the Portuguese discovery of this possibility in their fifteenth century explorations of the West Coast of Africa), was a highly profitable business, there was a steady supply of this kind of manpower for both the South and the North. In the South, the business was especially profitable, because of the high death rate of slaves on the plantations.

In the North, however, agriculture's needs for slaves was minimal. Slaves were part of household patterns as servants (as were nonblack indentured servants from various parts of Europe) and in other capacities, but as the North — and especially the New England area — moved toward industrialization in the first quarter of the nineteenth century, the need for another kind of manpower became apparent. This coincided with the time when many people from all parts of Europe wanted, for one reason or another, to come to what appeared to be a new "promised land." Thus, immigrants became the primary manpower source for the industrializing North.

During the first half of the nineteenth century, black slavery gradually faded out of the picture in the North, but in the South it was the base of the plantation economy until the Civil War. Immigrants continued to be the primary manpower source for the North, and gradually for other parts of the country. They had also composed a substantial part of the agricultural pioneers that opened up successive parts of the country — the Middle West, the Southwest, the Northwest, and the Pacific Coast.

The gradual drying up and final abolition of black slave labor as a manpower source can, to a large extent, be attributed to political-economic friction between North and South — i.e., the northern industrialists looked askance at the plantation economy as a possible generator of a landed aristocracy that would interfere with their economic ambitions — and in a minor degree to nationwide political and economic frictions and jealousies. Ethical motives, however, played some part. Although the Quakers were the only Christian sect that fought untiringly against slavery, a great many other individuals in the North raised public outcries about the system — among them the so-called abolitionists, who were possibly inspired by the British abolition of slavery in the middle of the nineteenth century. (However, it is not clear how much the British humanitarians were motivated by the discovered fact that slavery was a profitable form of manpower under the mercantilist approach, but very much less so under the industrial system.)

The interest in manpower information that emerged from this background could readily be met by broad overall data to support one side or the other of the bitterly emotional controversy and also the briefs of the more rational (at least ostensibly) defenders and assailants of the system. Population censuses had been the most usual source of information. The first official enumeration for the United States as a political entity was the census of 1790, which had been specified by the Constitution as the first of a series to be taken every ten years, to ascertain the basis for apportioning congressional representatives and levying direct taxes. With U.S. Marshals officiating as the census takers (which they continued to do for all censuses up to 1870), the enumeration reported the number of "free white males" and the totals of "free white females" and "slaves." In the 1820 census, questions were added on "slaves and free colored persons" by sex and age — four age groups being considered. In 1830, the age groups for slaves and the free colored population were increased to six.

## *The Period of Industrialization*

Thus, the intended use of the early enumerations was obviously not in the area of manpower. The economic problems faced by the new nation, no less complex than the political problems but perhaps less dramatic, were not seen in a manpower perspective. Alexander Hamilton, in repeatedly stressing the importance of the development of manufacturing for the young country, was fully aware of one of the central problems — the high cost and scarcity of labor — but his report on manufacturers had little effect on a predominantly non-manufacturing society.[1] By the 1830's, however, a clear "take-off" of the manufacturing sector could be observed, primarily in the Northeast states. In the 1840 census, the original scope was expanded to include a certain amount of economic intelligence, and attempts were made to produce some manpower data. The schedule included, for the first time, questions pertaining to the number of persons in each family employed in the major economic sectors — mining, agriculture, commerce, manufacturing, trade, inland and ocean shipping — and in the professions. Unfortunately this census suffered from numerous defects, some of which had been present also in European numerations: for instance, a family member was frequently classified by the occupation of the head of the household.[2]

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[1] A. H. Cole (ed.), *Industrial and Commercial Correspondence of Alexander Hamilton, anticipating his report on manufacturers* (New York: Kelley, 1928).

In the 1850 census, attempts were made to ascertain occupation separately for each household member over 15 years of age, and much of the enumeration's structure had been significantly influenced by Adolphe Quételet and the Belgian census of 1846 which he had helped to plan.[3] It was not only the first to be administered centrally from Washington, D.C. (although the fieldwork was still performed by local judicial offices), but also set the pattern for regular inclusion of some occupational information in subsequent population enumerations.

Prior to the 1880 survey, the entire census machinery was overhauled. The Superintendent of the Census was assigned a staff of field supervisors who were to recruit appropriate enumerators, who in turn would report directly and regularly to the supervisors. At the same time, the information to be gathered was considerably expanded, and separate schedules were provided for population characteristics, for agriculture, for manufacturing, and for mortality and various other social statistics. The 1890 census was the first to include data on the unemployed.

Following a long period of legislative proposals, debates, and hearings, a permanent Bureau of the Census was created by a statute of March 6, 1902, and originally lodged in the Department of the Interior; a year later it was transferred to the new Department of Commerce and Labor. The existence of a permanent Bureau made it possible to distribute over time some of the more ancillary inquiries. The 1910 census, therefore, could be limited in scope so as to give full attention to population and also occupational characteristics such as agriculture, manufacturing, mines, and quarries. It was the first to include special tabulations on gainful workers (Volume II), and can thus be credited with initiating the recording of modern labor force statistics.[4]

The beginnings of labor statistics (in the tradition of European labor statistics agencies) dates back to the 1884 creation of a Bureau of Labor in the Department of the Interior. In 1888, the Bureau became an independent Department, but without Cabinet rank. In 1903, it again became a Bureau, in the newly established Department of Commerce and Labor. In 1913, a full-fledged Department of Labor was created, to which the Bureau was transferred, and given a new name — the Bureau of Labor Statistics. Its primary mission remained, as spelled out in the Act of June 13, 1888 (under which its independence from the Interior Department had been set up), "to acquire and diffuse . . . useful information on subjects connected with labor." This information, following European tradition, included statistics on wages, hours of work, and data on the effects of "trusts and other combinations of capital upon production and prices," on production costs and comparative costs of living in foreign countries, on mortgage debt of farmers and its effect on the agricultural industry, on strikes and walkouts, and on a great many other topics.

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[2] John Koren, *The History of Statistics* (Macmillan, 1918), p. 674.

[3] See W. F. Willcox, in *Encyclopedia of the Social Sciences* (Macmillan, 1937), Vol. III, pp. 295 ff.

[4] See also John J. Durand, *The Labor Force in the United States, 1890-1960* (Social Science Research Council, 1948).

Manpower as a specific topic was apparently not one of the anticipated objectives. However, as the scope of the Bureau's activity rapidly expanded, it absorbed certain manpower fields that were not within the jurisdiction of other departments or agencies. Thus the *Monthly Labor Review,* the official publication of the Labor Department since 1915, also included data on employment and unemployment and on immigration. In addition, the Bureau collected specific manpower information through industry studies, among them the justly famous study of the iron and steel industry (1912). In the tradition of older statistical agencies and within the general context of protective labor legislation (in which some of the New England states had a most distinguished history), the agency collected statistics on woman and child wage earners. This activity became so extensive that a Children's Bureau (1912) and a Women's Bureau (1920) were organized to cope with the collection of the relevant statistical data.

In the meantime, the Census Bureau had continued to collect manpower information in each of the decennial population censuses. Beginning with the 1910 census, occupational statistics were published as separate volumes: Volume IV for 1910 and 1920, and Volume V (general report on occupations) for the 1930 census. In 1931 there was a special unemployment census. Interest in and generation of manpower information had also been expanded by other activities of the federal government. For example, a special Industrial Commission, established in 1898, four years later submitted a voluminous report on agriculture, manufacturing, and business. And a special Immigration Commission, established in 1907, in 1911 published a forty-volume report, which also contained a review of immigration data since 1820.[8]

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[8] The so-called Industrial Commission was provided for in the Act of June 28, 1898, with a commitment "to investigate questions pertaining to immigration, to labor, to agriculture, to manufacturing, and to business." The Commission's report was submitted in February 1902. The special Immigration Commission, created pursuant to the Immigration Act of February 20, 1907, was enjoined to make "full inquiry . . . into the subject of immigration." The reports of both Commissions were, of necessity, highly statistical in nature, and the Commissions were usually referred to as "temporary agencies for statistical inquiry."

The report of the Industrial Commission was largely based on available statistical data. Although the first quinquennial census of manufacturers was not undertaken until 1904 (after the Commission's report had been completed) statistical data on manufacturing had been collected in several of the earlier censuses (first 1810 and then from 1830 on in each of the decennial censuses). The 1870 census included information on the "products of industry" (Schedule 4), but no corresponding manpower data; in 1880 there was a special schedule on manufacturing, but again no manpower data. The 1890 census made the first major attempt to gather manpower information on industrial employees; a special Schedule 3, directed to "productive industry" establishments, contained as Item 6 a question on labor and wages. Although the specific arrangement varied with the type of industry, Item 6 inquired about the "average number of employed," requiring separate listings, by basic categories, of (1) males above 16 years of age, (2) females above 15, and (3) children. Different terms were used where appropriate — for example, in mining: operatives, engineers, and other skilled workers; officers of firm; clerks and salesmen; watchmen, laborers, and other unskilled workers; and pieceworkers. The usefulness of this information was further enhanced by subdivision into a number of specific "industries," which, although far less detailed than the present industrial classification, was impressive for its time.

The information was based on the firm, business, or establishment as an enumeration unit (the so-called "establishment approach"). Earlier population censuses had based their surveys on households or individuals ("population approach"). For instance, the 1820 population census attempted to enumerate persons engaged in agriculture, commerce, and manufacturing separately for the three divisions. After the 1840 census, this list was expanded to include mining; navigation of the ocean; navigation of canals, lakes, and rivers; the learned professions; and engineering. In 1880, a question was added to ascertain the number of months a person had been unemployed during the census year. The instructions stressed that the inquiry into profession, occupation, and trade "is one of the most important questions in this schedule." The same census also had questions on the health of the respondents. Thus, there was indicated a clear recognition of the importance of certain kinds of manpower information for economic development — a recognition that was far ahead of the concepts of most other industrial countries of the time.

The report of the Immigration Commission of 1907 raised questions and summarized information of the utmost significance for the description of the manpower reservoir. Immigration to the United States, for a long time the most important and, during the earliest years almost the only, source of manpower, was of course a subject of the utmost concern. From the very start, the physical resources of the young nation seemed unlimited, with manpower shortage the only real threat — or at any rate serious obstacle — to rapid economic growth. And the values epitomized in the phrase "Land of the Free" had inspired several generations of immigrants to become a most welcome manpower source. However, throughout the period of heaviest manpower need, there was no national manpower policy directed to official inducement of immigration. Unlike the policies in the British dominions and in many Latin American countries, the United States left solicitation of and assistance to immigrants to private labor "brokers."

Some of the problems and pathologies with respect to immigration were first highlighted in complaints about "alien paupers" made by the main states of entry — New York and Massachusetts — during the 1830's and 1840's, and in pressure from U.S. labor groups for protection from foreign labor competition. Nevertheless, there was still not much evidence of felt need for information on immigration. Only later, within the context of formulating restrictive immigration policies, did pronounced interest in data emerge.

The first laws restricting immigration were aimed (1862) against "Chinese coolies." Other restrictions were added successively: against "lunatics and prostitutes" (1875); mental defectives and persons likely to become public charges (1882); contract labor (1885); polygamists and persons suffering from certain diseases (1891; and anarchists (1903). As the laws multiplied, provision was made for their implementation through an administrative framework that eventually became the source of much information related to immigrants.

In 1891 the Bureau of Immigration was created and located in the Treasury Department. In 1903 it was transferred to the Department of Commerce and Labor. In 1913 it was once more transferred, this time to the new Department of Labor. Prior to the Bureau's creation, administration and enforcement of immigration laws had been a matter for the states. Although some operating data did accrue during that period, no systematic collection or processing was undertaken. Immediately after its inception in 1891, the Bureau established an inspection service to begin compilation, in considerable detail, of a great volume of information pertaining to immigrants.

The compilation was further expanded by a provision in the Immigration Act of 1907, which established within the Bureau a division of information. A precise schedule for data was set up. The basic data on individual immigrants were to be entered on lists (the ship's manifest) by the ship's officers at the time of embarkation. They were to include, in addition to the usual personal data, information on occupation; literacy; amount of money possessed; possible former incarceration in prison, alms house, or mental institution; possible prior agreement to perform contract labor in the U.S.; present mental and physical condition, including any physical deformity. Arrangements were made to obtain similar information for immigrants entering from Canada and Mexico. Comparable, but less detailed, information was also to be collected by customs officers from aliens leaving the United States.

The information thus collected was subsequently expanded to include, in some detail, every immigrant's educational and training background and prior job history, if any. The collecting was later entrusted to U.S. consular agencies, which were responsible for forwarding it to the Bureau after careful checks on its validity and veracity. Therefore, as far as the foreign-born were concerned, the United States had, beginning in 1907, one of the most complete qualitative data collection schemes. Information on the training and education of individuals was of considerable practical value for the description of the qualitative aspects of the manpower reservoir. The kind and depth of education of individuals had by now become a generally accepted if rough indicator of the quality of manpower. Such information seemed especially appropriate in the absence of more implicit and explicit descriptors of a person's skills and aptitudes.

The main sources of nationwide education data in regard to United States citizens have been the U.S. Office of Education and the Bureau of the Census. Data collected by the Office of Education, however, were usually obtained, not from individuals, but from state and local school systems and from institutions of higher learning. Particularly in early times, relating this information to individual persons would not have been feasible; such information could not be considered as directly applicable to the description of manpower quality for other than the most general and aggregative characterization. Also, educational statistics have traditionally given manpower characteristics as of the time an individual is actually in the process of being educated, i.e., at the time of enrollment, of completing a given course, of graduation, etc. Such information is useful, however, in predicting the quality of future manpower, and it is indispensable in estimating present and future loads on educational systems and facilities — the primary objective of educational statistics in the adminisrative sense.

Nevertheless, if characterization of the qualitative composition of the active population is desired, educational statistics, often the only source of information, are not by themselves very helpful. As such statistics have developed in this country they are "establishment" type of data, primarily intended to underpin the framing and carrying out of educational policies. Also needed, therefore, is "population education" type of information to serve the description and analysis of some of the qualitative aspects of the nation's manpower resources.

This need gives the census, another source of educational information, particular significance. The earliest and most primitive form of what might be considered a forerunner of statistics on education proper is information on literacy. The U.S. census, as early as 1840, included a question on illiteracy, concerning white males over 20 years of age. The question was asked of the family head, very possibly an unreliable source of information. More nearly adequate census information on literacy, in reference to those of the population from 10 years of age on and classified separately by persons able to read and persons able to write, has existed since 1870.

Next in sequence was census collection of information on school enrollment. As defined, enrollment referred to school attendance during a stated period preceding the census date, but the period has varied in length in successive censuses. Also, the question was asked with respect to individuals in variously specified age groups, say from 5 to 34 years in some census, from 5 to 24 years in others, and persons of all ages in still others. Our point here is not that these changes complicate comparison for those who wish to make the comparisons (there were also other changes, e.g., in definition, coverage, and the like), but that they demonstrate a salient fact: beginning with the first collection of enrollment data by the census (1850), such information was aimed at the needs of educational policy rather than at the need to compile manpower characteristics.

Only much later, starting with the 1940 census, were questions added on so-called educational attainment. The questions were subsequently refined to permit differentiation between attendance and completion. Because they were asked of everyone, without limitation to specific age group, they give the first picture of the educational characteristics of the general population. From then on, census-based information was available on the quality, in terms of some educational aspects, of the manpower resources of the nation.

Other data that have furnished some nationwide information on qualitative as well as quantitative aspects of manpower were supplied by the operating statistics which accumulated in the files of the U.S. Employment Service. Here the United States was a relative latecomer, having relied longer than some of the European countries on the unaided, self-regulating mechanism of the "free" labor market as the exclusive means for matching jobs and men. The appearance of a federal employment service marked a significant change in the scope of manpower policy. In the wake of the severe economic crises of the last decade of the nineteenth century and the first part of the twentieth, the unemployment problem accompanying industrialization and urbanization was felt to reflect a major ailment of the economy and to require high-level and nationwide remedies. One of the most acceptable directions for such manpower policy seemed to be an implementation of the labor market mechanism by a government-sponsored instrumentality for the matching of jobs with men, especially for those people who would find it difficult to secure a job by themselves.

Although several sporadic state and local efforts had been made late in the nineteenth century (for instance in Ohio in 1890) toward some form of public employment facilities, the first federal attempt of this kind was the creation in 1913 of field offices and branches in eighteen zones under the Bureau of Immigration and Naturalization of the recently organized Department of Labor. It is revealing that this first step was undertaken within the context of manpower policy aimed at protecting immigrant labor. Also, when increasing general interest began to be manifested in public employment policy, the rationale for regulation and operations was directly and intimately connected with unemployment relief. The information function of the Bureau was generally confined to attempts to secure employers' requests for immigrant labor, which in turn were matched with immigrants' applications for jobs.

### *World War I and the "Great Depression"*

This situation changed drastically during World War I, when manpower shortages put a very different complexion on current manpower problems. The rapidly increasing work load of the Employment Service brought about reorganization of the entire system. The Service was removed from the Bureau of Immigration and Naturalization and remodeled as a new agency — dubbed the United States Employment Service — and placed in the Department of Labor. However, at the end of World War I it quickly disappeared as a national entity, and its offices were taken over by state and local jurisdictions. Hence, lack of uniformity and coordination made this potentially unique source of manpower information of little significance for national manpower policy, and inferior to the information sources developed by the British and German systems.

The next major change in emphasis on manpower policy was brought about by the disruptive social and economic effects of the depression of the 1930's, when the manpower problem became one of the most pressing issues. The earlier federal instrumentalities for direct participation in labor market processes were revived. After several unsuccessful attempts, federal-state employment service machinery was established in 1933 (the Wagner-Payser Act). An integral part of the machinery was the provision that participating states would agree to maintain uniform records and statistical procedures, as directed by the federal agency. The scope of the resulting information remained narrow, because of the limited coverage of the Public Employment Service. Only a small proportion of employers and employees made use of the Service, possibly because most people associated it with unemployment relief. (This same sparse use of such services was seen in Sweden, for instance, where, although the public employment service was well planned and among the most successful of all such services, the volume of placements did not exceed a third of the national total. And in Great Britain, the volume was only about one fourth of the total placements of manual workers.)[6]

From the point of view of manpower information, the real significance of the United States Employment Service was not as an actual source of data at that time, but rather its role in developing systematic research in the difficult and complex problem of manpower skill and aptitude measurements. In this light, the careful evolution of an occupational taxonomy, published in the form of the *Dictionary of Occupational Titles* (DOT), and the expanding testing program of the Service must be considered more enduring contributions to the growth of manpower information in this country than the Service's collection as such of operating and other statistics.[7]

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[6] See, for instance, Organization for European Cooperation and Development, *International Seminar on Public Employment Services and Management* (Madrid, 1965-1).

The depression of the 1930's also saw the beginning of another major potential source for manpower statistics: the Social Security System provided by the Social Security Act of 1935. (This is discussed in more detail in Chapter III.) From then on, operating statistics on old age, survivors, disability, and unemployment insurance rapidly accumulated in the files of the Social Security Administration. However, in their direct relevance to manpower, they have been limited by their restriction to manpower in "covered" employment, and by the nature of the information. Here again, one of the outstanding contributions of the successful collection of manpower information has been a taxonomic one: the identification of each of the thousands of payrolls in terms of the Standard Industrial Classification (SIC) of the reporting employers. (It is no coincidence that the SIC was a child of the Great Depression. It was prepared by the Committee on Industrial Classification, under the auspices of the Central Statistical Board, the predecessor of the Office of Statistical Standards in the Bureau of the Budget, during the years 1937 to 1939.)

During all of this period the Census Bureau continued to be the major comprehensive source of manpower information. One of its few weak points had been its so-called occupational data, which until 1910 were rather deficient, to say the least. As noted, earlier censuses did classify the population by "occupation," but in actual practice the classification was one of "industry." The first "occupational" data — those in the 1820 census — resulted from merely grouping the active population by place of work into agriculture, commerce, and manufacturing. These groups were expanded in the 1840 census, the next one to raise the occupational question at all, and further expanded in subsequent censuses. But a question on actual occupation appeared for the first time in the 1850 census, which listed 323 separate occupations, summarized in 10 industrial divisions. And not until 1870 was the occupational question directed to the population at large. From 1850 the number of occupations had not remained the same for any two censuses, fluctuating, for example, from 218 in 1890 to 572 in 1920. In 1938, however, the Central Statistical Board sponsored (in cooperation with the American Statistical Association) a joint committee on occupational classification which formulated a convertibility list. But even this list was drawn up to facilitate comparability of the several occupational classifications rather than to furnish a standard classification per se.

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[7] The first edition of the *Dictionary of Occupational Titles* (published in 1939) lists nearly 30,000 job titles; the second edition (1949), over 40,000; and the third (1965), over 35,000.

In the meantime, there had been several nonofficial attempts to describe the composition of the active population in terms of so-called socioeconomic groups.[8] But not until the 1930 census was such an attempt undertaken as an official effort by an agency of the federal government. The Census Report, "A Social Economic Grouping of the Gainful Workers of the United States, 1930" undertook to group the active population as follows: (1) professional persons; (2) proprietors, managers, and officials; (3) clerks, etc.; (4) skilled workers and foremen; (5) semiskilled workers; (6) unskilled workers.

The period was also of considerable importance for manpower information because of the introduction in the 1940 census of a change in basic concept — from the earlier "gainfully occupied" to "labor force" as an identifier of manpower. In practice, the gainful worker concept aimed at "usual" occupation, the labor force concept at "actual" occupation, generally during a brief period preceding the enumeration. This changeover to the labor force concept resulted in considerable technical improvement of the data and their validity, but was not necessarily a step forward in terms of the conceptual requirements of manpower analysis.[9]

From the manpower point of view, a main advantage of the "gainful worker" approach is its greater stability over time; findings based on it are less subject to what might have been temporary circumstances at the time of the enumeration. On the other hand, it suffers from indefiniteness when applied to persons who do not have "a single definite occupational role," i.e., those engaged partly in gainful and partly in nongainful activities, and the unemployed.[10] Put differently, the "gainful workers" concept assumes that a person plays a more or less stable occupational role, which is more or less independent from his activity or lack of activity at any given moment. The "labor force" concept, on the other hand, is more suitable for the measurement of short-term changes of the active population. Before World War II, the United States was the only major country to adopt the labor force approach. An earlier recommendation by an international body had been in favor of the "gainful worker" approach or a modification thereof. The suggestion was to base the identification of the economically active population "on the occupation at the moment of the census. A person who has recently exercised a gainful occupation is to be considered as still engaged in that occupation even though by reason of sickness, injury, vacation, or inability to obtain work, he may, at the time of the census, be temporarily not working."[11]

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[8] See William C. Hunt, Bulletin No. 11, U.S. Department of Labor (July 1897); also Carroll D. Wright, *Outline of Practical Sociology* (Longmans, Green, 1899), pp. 254 ff.

[9] See, for instance, Alba M. Edwards, *Comparative Occupation Statistics for the United States, 1870-1940* (U.S. Bureau of the Census, 1943).

[10] See United Nations, *Application of International Standards to Census Data on the Economically Active Population* (1951), p. 6.

[11] League of Nations, *Statistics of the Gainfully Occupied Population*, Studies and Reports on Statistical Methods, No. 1 (Geneva, 1938), p. 9.

After World War II, however, with the changed economic and political situation of the postwar readjustment, general opinion swung away from the "gainful worker" and toward the "labor force" approach. Rather than a person's occupational role, labor market activity at a given point in time became the primary criterion which, among other recognized advantages, greatly facilitated the use of census bench marks for the adjustment of unemployment series.[12]

As the nineteenth century turned into the twentieth, there had been much activity in the formation of data stores pertaining to special manpower categories such as railroad workers, civil servants, veterans, and various agricultural activities. Although such information was mostly in the form of operating data, it was also useful for manpower policy oriented toward stockkeeping and analysis.

The problem that was to dominate national manpower strategy, beginning with the depression of the 1930's, and that had also caused some concern during the earlier part of the century, was unemployment. Anxiety about its social implications led to a quest for more information than was previously available. Beginning in 1880, the regular decennial censuses (as mentioned earlier) included a simple question to identify the unemployed. The first special unemployment census was conducted early in 1931. The second followed in 1937 (The Census of Partial Employment, Unemployment, and Occupations).

In addition to the federal government's activities aimed at providing manpower information, various states were engaged in data collection activities which preceded, in some instances, those of the federal agencies. The Massachusetts Bureau of Statistics and Labor was originated in 1869, Pennsylvania's in 1872, and Connecticut's in 1873. The Industrial Commission of Ohio was initiated in 1913, and that of New York in 1915. Most of the information related to manpower was a by-product, accruing, for example, in connection with factory inspection, industrial accidents, and other welfare-oriented administrative functions. Although this state information reflected the geographic pattern of early industrialization, its usefulness for setting manpower policies was limited and its statistical significance small.[13]

Seen as a whole, the statistical activities of the United States Government could by the last decade of the nineteenth century be compared favorably with those of the two data-gathering giants — Great Britain and Germany. Francis A. Walker, considered by many as the leading authority on the statistical work of the United States during its early development, when addressing the opening session of the International Statistical Institute (meeting in Chicago in 1893) said: "No government in the world has ever lavished money more generously upon statistical inquiry," and that "a strong passion for statistics early developed itself in the life of our people."[14] This was not flag-waving, but a valid description. However, the statement actually applied more fully to areas of data collection other than manpower. The great leap forward for manpower data had to wait for the fillip provided by the Great Depression and by World War II.

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[12] See, for instance, Durand, *op. cit.*, p. 12 (see our footnote 4, above).

[13] See Charles F. Gettemy, "The Work of the Several States of the United States in the Field of Statistics," in Koren, *op. cit.* (see our footnote 2, above).

The data machinery thus far described was in essence given over to the production of macro information — i.e., data on the highest levels of aggregation, collected by agencies of the government. Such data were primarily intended for use by decision makers facing problems on national levels, in the realm of what is usually referred to as national manpower policy. But other kinds of manpower decisions are of considerable practical importance, if for no other reason than the huge number of them that must be made daily. These are the decisions made by many thousands of employers involved in selecting and hiring the many millions of individual members of the labor force. Corresponding decisions must be made by millions of persons on whether or not to seek employment and if so, in what economic activity, and then whether to accept a specific job offered.

For many earlier generations, such "choices" had been limited by unquestioned traditional circumstances and social mores. The emergence of a "free" labor market was one of the major conditions for the confrontation of demand for labor with supply of labor. The transition from the earlier economic structure to the later industrial system was very gradual. Hence, the pattern of entrepreneurship varied from country to country, and within each country from industry to industry. The British manufacturing industry was commonly regarded as the mainspring of what became known as the Industrial Revolution. From there it expanded to other areas, among them the colonies of North America that later became the United States, which benefited from a great many innovations that had evolved in Great Britain. These included not only technological inventions but also procedures of resource allocation and of management practices.

In regard to manpower resources, however, the situation was quite different. The relatively high-profit margins of early British manufacturing industries, especially the textile industry, did not (at least at first) require a careful and punctilious weighing of means and ends. Accounting practices, which were highly developed by that time, were extensively used in the management of British companies, but much more in respect to general cost of inputs than to capital and labor. Sophisticated capital accounting was rare, and manpower accounting was practically unknown. Although the literature on accounting had made great strides since the introduction of the art of reckoning during the Renaissance, in most of the nineteenth century there was a conspicuous absence of accounting handbooks, guides, or systems adapted to the needs of the managers of the expanding manufacturing industries.[15]

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[14] Walker, a brigadier general in the Civil War, was later called to Washington as chief of the Treasury's Bureau of Statistics. In 1870 and 1880 he was superintendent of the Census. In 1880 he became president of the Massachusetts Institute of Technology. From 1886 to 1892 he was president of the American Economic Association.

The main task of accounting, as applied to industrial management at the time, seems to have been the detection of error and fraud rather than the determination of aggregate costs and profits of the enterprise.[16] No generally accepted rational calculus existed to help the manager in his decisions concerning allocation of the various inputs or comparison of profitability of alternative courses of action. Only during the latter part of the nineteenth century did the records show any specific concern about labor input (i.e., productivity), and even then mainly in connection with the elaborate and complex wage determination of the time, especially where piecework was involved.

In the United States the situation was quite different. From the beginning of the U.S. manufacturing industry, managements had to fight against fierce competition from abroad (notably from England) and against labor shortages. And one of the main disadvantages for the young industry was that its wage costs were much higher in relation to profits than were Great Britain's.

The manufacturing industries in the northeastern United States — textiles and, later, textile machinery and such other machinery industries as machine tooling and locomotives — required highly skilled manpower. The crucial role of manpower was further accentuated when the rapid expansion of the domestic market led to an increase in the size of plants and to a high degree of manpower specialization and division of labor. With the increasing availability of new production techniques, and the consequent need to consider trade-offs between laborsaving machinery and manpower, management very early became acutely conscious of the significance of productivity.[17] In the ensuing decision problems, cost accounting data began to be an increasingly important tool. And since labor of quality was a high-priced input, management policy began to give as much attention to personnel selection, improvement of labor productivity, and the role of manpower in general as it had formerly given to decisions about capital equipment, production processes, and distribution methods.

By the beginning of the twentieth century, concerted and highly rational efforts to increase industry's efficiency had become one of the major factors in this country's undisputed high level of industrial performance. The ideological result, especially in view of the then prevailing fashion of positivism and behaviorism, was a pervasive climate of factualism.

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[15] See, for instance, A. C. Littleton and B. S. Yamey, *Studies in the History of Accounting* (R. D. Irwin, 1956); and the ample literature quoted in Sidney Pollard, *The Genesis of Modern Management* (Harvard University Press, 1965), p. 317.

[16] Pollard, *ibid.*, p. 215.

[17] See *Cambridge Economic History of Europe,* "The Industrial Revolution and After" (Cambridge University Press, 1963), Vol. VI, Part II, Chap. 8.

In Great Britain there had been some early recognition by management of the human input — i.e., of a manpower problem on the micro level of the firm. The outstanding example was Robert Owen's management of the New Lanark cotton mills in Manchester at the beginning of the nineteenth century. Owen, apparently an unusually capable administrator, recognized the importance of skillful management of labor but his approach was largely philanthropic. His efforts never resulted in broadly applicable techniques, although during the century they influenced social theory in both England and the United States to some extent.

## *The Role of Industrial Management*

Throughout the nineteenth century, industrial management in the United States found the selection and placement of people a vexing problem. The rapidly increasing demand for an efficient and complex work force made reliance on earlier methods of manpower selection (based on informal interview and references) quite impractical. More efficient and discerning selection methods had to be found; they also had to be suitable for the selection of large numbers of employees from a great mass of applicants.

Another constant search involved ways to improve labor productivity in the plant. Methods of work measurement and "scientific management" began to be applied to industrial practice and also to the manpower resources problem. This was the period characterized by the remarkable success of Frederick Winslow Taylor and the "system" named after him.[18] So-called efficiency engineering attracted the active interest of industry. By analogy, selection principles were sought which would heavily rely on "objective" measurement and quantitative fact. A welcome "handle" to the problem was seen in the work of the early industrial psychologists, and especially of German psychologist Hugo Muensterberg, who taught his principles at Harvard University from 1892 to 1895, and again from 1897 to 1916.[19] The new research results soon found their way into the practices of American industry, being accepted earlier and with much more enthusiasm than in their continent of origin.

In Europe, the tendency was toward more nearly personalistic and "wholeist" views, underpinned by the phenomenological school of philosophy that favored an "individual approach" and a type of diagnostic procedure in which subjective impression and subjective procedure played a major part.[20] This trend was reinforced by the mass classification and "placement" problems faced by European military establishments during World War I, which resulted in the famous verbal and nonverbal group tests, the Alpha and the Beta.

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[18] See F. W. Taylor, *The Principles of Scientific Management* (Harper, 1911).

[19] H. Muensterberg, *Grundzuege der Psychotechnik* (Berlin: J. A. Barth, 1914).

For both the United States and the industrialized nations of Europe, concurrently with and partly as a consequence of the development of methodology, new and urgent data problems arose. A first and major step toward solution was the increasing concern about definitional and conceptual aspects of the phenomenon to be described and measured. An entire taxonomy had to be developed that would ultimately permit analytical decomposition of job patterns and occupational skills into skill modules comparable, in turn, to corresponding classifications of elements of human aptitudes and skills. Thus, the foundations were being laid for an ambitious information program which, much later, resulted in the complex and sophisticated manpower information systems now extant within large corporations and elsewhere. The beginnings, of course, were very slow, but by the end of World War II, a good deal had been accomplished. However, as of the last years of the 1960's, much still remained to be done

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[20] P. J. Drenth, "Some Current Issues in Selection and Placement Research," in *Manpower Planning: A Conference Under the Aegis of the NATO Science Committee, Brussels, 1965* (American Elsevier Publishing Co., 1966).

# III. The Great Stocktaking

By the 1950's the importance of adequate manpower and labor force information in the United States had been definitely established. Although in some respects a latecomer, this nation had become the foremost producer of statistical information in general and of statistical data on manpower in particular. The information was remarkable if viewed in terms of its volume and quality, although perhaps somewhat less impressive if examined from the standpoint of its systematic coordination and analytical exploitation.

During most of the years when the information was being compiled, U.S. manpower policy had been focused on various aspects of the employment question, almost to the exclusion of all other considerations. And throughout the 1950's, this concern became even more predominant under the pressures of an acute unemployment problem and the numerous political and social issues surrounding it. Thus manpower information was mainly designed and used to underpin the policies that sought to resolve these issues. But there had never been a major and comprehensive stocktaking of the efficacy of the information, both per se and in regard to the manner of its application. In 1961, this long lack was finally terminated.

## *The Gordon Report*

A White House press release of November 10, 1961, announced the appointment of "The President's Committee To Appraise Employment and Unemployment Statistics." At immediate issue were the politically very sensitive employment statistics.[1] The committee, under the direction of Professor R. A. Gordon (and therefore usually called the Gordon Committee) fortunately interpreted its assignment broadly.[2] Its report — issued in September 1962 as *Measuring Employment and Unemployment, 1961* — therefore constituted the most extensive analysis (to date) of this nation's employment and unemployment statistics. It was, of course, also the first such approach ever made in the United States to the appraisal of information facets of manpower issues.

By the middle of the twentieth century, the collection of statistics for and by the United States Government had become a highly complex and decentralized operation. Data were being produced through an involved and manifold structure of many departments, bureaus, and agencies, whose statistics-generating jurisdictions were not always clearly separated, especially as to subject matter. And manpower information, in particular, had been accruing in a bewildering number of agencies and bureaus, whose routine job was to collect it. It also emanated from the decennial censuses and associated special industrial surveys, and as a by-product of the administrative and operative functions of various other agencies.

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[1] Both the relatively high unemployment figures and an aggressive article, "Let's Look at Those Alarming Unemployment Figures," in the September 1961 *Reader's Digest* apparently played a part in bringing about the appointment of the Gorden Committee at that time. See *Hearings Before the Joint Economic Committee's Subcommittee on Economic Statistics*, 88th Congress, 1st Session (June 6 and 7, 1963).

[2] Besides Professor Gordon (University of California, Berkeley), members of the committee were Professor R. Dorfman (Harvard), M. R. Gainsburgh, (then Vice President of the National Industrial Conference Board), Professor A. E. Rees (University of Chicago), S. H. Ruttenberg (then Director of Research, AFL-CIO), and Professor F. F. Stephan (Princeton).

When the Gordon Committee began to examine the major statistical generators, other than the census, they were confronted by the following groups of surveys: (1) the so-called population surveys, of which the Current Population Survey (CPS) is the outstanding example; (2) establishment surveys (also referred to as employer surveys), such as those undertaken by the Bureau of Labor Statistics (BLS) and by the Department of Agriculture; and (3) the statistics collected by and accruing to the Bureau of Employment Security in cooperation with corresponding state unemployment insurance agencies. All three surveys were oriented to the labor force, i.e., aimed at statistics on the employed and unemployed, and thus were relevant to the mandate given the Gordon Committee by the President.[3]

All of the surveys were children of the depression and postdepression years, with heavy emphasis on the measurement of unemployment. The oldest of the three groups — the establishment surveys through which employment and payroll information were collected from a sample of employers — traces back to 1915, when a survey of employers for four manufacturing industries was initiated by BLS; later, after 1921's minor depression, the coverage was expanded to over fifty industries. In 1921 a sample of employers in mining, public utilities, trade, construction, and in a few service industries was added. But not until 1936 were these estimates extended to measure nationwide employment covering the nonagricultural industries as a whole.

During and after World War II, this collection scheme was amplified, in that the operating statistics developed by the still young Social Security Agency, largely based on (1) the quarterly employee reports filed with the Agency and (2) the contribution (tax) reports filed by the employers with state agencies which carry out the state unemployment compensation laws, were utilized in the BLS establishment survey program to serve as bench marks for its labor force estimates. Shortly before the creation of the Gordon Committee, this survey program was further enlarged and improved by the addition of new industries, by the preparation of estimates by size of firm for most industries, and by casting the data into the framework of the standard industrial classification.[4]

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[3] "The statistics of employment and unemployment are of vital importance as measures of the economic health and well-being of the nation. They serve as guides to public policy in the development of measures designed to strengthen the economy, to improve programs to re-employ the unemployed, and to provide assistance to those who remain unemployed." (From the White House press release of November 10, 1961, announcing the appointment of the Committee.)

The second major flow of manpower data stemmed from (1) the operation of the employment security programs; (2) from state programs, which account for nearly 90 percent of the total coverage; (3) from the unemployment compensation programs for civil servants (UCFE); and (4) from the Railroad Retirement Board's program.

Cooperative federal-state programs had, by 1938, expanded to all states, and although the information generated by state and local offices was, to a considerable extent, aimed at local labor market conditions, there was inherent in the federal-state programs an instrumentality for producing nationwide data under the guidance of the Bureau of Employment Security. This Bureau, created by a Presidential order in 1939, merged the U.S. Employment Service with the Bureau of Unemployment Compensation in the Social Security Board; it was subsequently transferred to the Department of Labor. It remained strongly decentralized in its primary operating interest, and the ensuing operating data are to this day the single most comprehensive source for local labor market data. However, this strength is also a weakness, when considered in the light of national manpower information.

A first limitation of the information is, of course, its statutory restriction to that part of the labor force which is covered by the respective programs. Thus, unemployed who are not covered by the law, those who have exhausted their claims, and those who for one reason or another do not file a claim at all are not captured by the current records. The reluctance of some unemployed to register with the USES tends to create bias in favor of the unskilled and against young workers. On the other hand, the information is available in considerable geographic detail, although not suitable for inter-local comparison, and, unlike the establishment data, is generally micro information, producing data on individual job applicants rather than on entire organizations such as firms and establishments. The records, therefore, would seem to be potentially interesting as sources of information on skill and occupational composition of the labor force. Also, the operations of the agencies involved are most directly oriented toward individual labor markets.

The best known source of manpower information is the Current Population Survey (CPS) of the Census Bureau. The sampling units are individual households; this kind of survey is therefore also referred to as a population or household survey to distinguish it from an establishment survey. As noted earlier, the

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[4] See Bureau of Labor Statistics, *Handbook of Methods for Surveys and Studies,* Bulletin 1,458 (1966); and *ibid., Technical Note In Employment and Earning Statistics for the United States 1902-1962* (1963).

CPS was invented during the depression of the 1930's for the explicit purpose of providing estimates of the number of unemployed. It was, therefore, a labor force survey *ab initio,* intended to supplement the only other national estimate of employment and unemployment — the one derived from the decennial population census.

The pressing unemployment problem of the 1930's, together with the absence of satisfactory information on the amount of unemployment, led the government to undertake a household survey program in 1940, through one of the most directly concerned agencies, the Works Progress Administration (WPA). The resulting publication, *Monthly Report on Unemployment,* was transferred three years later to the Census Bureau, where it was given the name of *Monthly Report on the Labor Force.* It soon became the outstanding example of the application of modern theory of population sampling to an actual and continuing national survey program.[5] So successful was this first major attempt to establish sampling in its own right that the survey's scope began to expand. Eventually the survey developed into a general vehicle for regular inter-censal observation; the change in emphasis and function was reflected in the change of its title in 1948, to Current Population Survey. The Census Bureau still designs and conducts CPS (which currently produces a great deal of diverse information, ranging from consumer intentions to a wealth of demographic data and vital statistics), but publication and analysis of specific labor force characteristics — the original scope of the survey — were transferred to the Bureau of Labor Statistics in 1959.

This, then, was the information situation faced by the Gordon Committee when it undertook its task to "appraise the statistics of the information available on employment and unemployment, and to make recommendations for any changes or improvements that current conditions seem to require."[6]

The manpower information questions dealt with by the eventual Gordon Report represent four major problems (briefly discussed below): (1) concepts and definitions; (2) information disaggregation; (3) systems-oriented issues; and (4) questions not directly relevant to the problem here presented.

Earlier controversies over the "gainful employment" concept and the "labor force" concept had finally been settled in favor of the latter. One of the main unresolved conceptual issues was the definitional dilemma arising from two opposed concepts of unemployment — one of them oriented to welfare and the other to resources. The welfare orientataion had been the early traditional approach, closely related to the history in this country of political concern about the lot of the unemployed; the resources orientation became manifest much later when manpower gradually began to be viewed as a national resources problem. Thus, depending on whether the immediate problem was one of labor excess (as during the depression of the 1930's and again during the subsequent recession periods) or occasionally one of shortages (during periods of war and more generally with respect to highly specialized personnel), policy had oscillated between the welfare and the resources point of view. The time immediately preceding the appointment of the Gordon Committee was characterized by worry about excess manpower, and hence by the very sensitive political question of how to absorb the unemployed.

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[5] U.S. Bureau of the Census, Sampling Staff, *A Chapter of Population Sampling* (1947).

[6] White House press release, November 10, 1961, as cited in *Measuring Employment and Unemployment* (1962), p. 229.

The Committee therefore addressed itself (in the conceptual area) to the whole question of employment definition to determine the effect of various definitions on the absolute and relative size of the resulting figures. Thus, the Committee was, for example, concerned about how to insure that only such persons without jobs who are actually and effectively looking for work be counted as unemployed; about whether those who have stopped looking for work because they assumed that no work was available should be excluded; and about how to deal with seekers of only part-time jobs. The Committee also faced the conceptual problems of whether to count as employed those persons who worked for less than five hours a week, and whether to include in the unemployment count persons in the age groups of 14 and 15.

Specifically, the Gordon Report recommended that those working less than five hours per week be shown separately from all others employed; that the unemployed who were 14 to 17 years old be tabulated separately from those 18 years and over; and that additional research be undertaken to sharpen concepts with a view to ascertaining the actual steps undertaken by the unemployed toward securing a job during the preceding six weeks. In addition, the Report recommended that more emphasis than heretofore be placed on securing information on those not in the labor force at all, i.e., on those counted neither as employed or unemployed.

These recommendations illustrated the Committee's recognition, by and large, of the widely-felt need to arrive at "equitable" and also politically defensible unemployment figures. The recommendation concerning the gray area of persons not definably in the labor force, however, tended toward a view of manpower as a national resource rather than as a primarily social and welfare-oriented issue. The Report also touched on the question of measuring underemployment and on the related question of the propensity of currently unemployed persons actively seeking a job to work (in terms of hours). Its recommendation in this regard was that, in addition to the regular survey question on whether or not a person out of a job was actively engaged in a job search, the approximate number of weekly hours wanted should also be probed — which again indicated the emerging concept of manpower as a realized resources potential. This slight shift in emphasis was also interesting because of the recent gradual trend of manpower analysis toward resources or input problems rather than toward the traditional and formerly predominant problems of income maintenance.

### *Recommendations and Major Implementations*

By the beginning of 1967 several of the Report's recommendations had been implemented to some major extent, if not completely. For instance, the schedule of the Census Bureau's Current Population Survey (January 1967) showed a number of changes.[7] First of all, the sample had been enlarged — from 35,000 to 52,000 households and from 357 to 449 sample areas. The five other changes that reflected the Report's conceptual shifts are discussed categorically below:

1. The "members of the labor force" concept was changed to include only persons 16 years old and older; thus the major tables on the labor force and its characteristics were based on that part of the population. Data had been collected for 14 and 15 year olds, but were shown separately.

2. Only those respondents were counted as unemployed who had been engaged in some job-seeking activity within the prior four weeks (unless they were waiting to be recalled from layoff or were to start a new job within thirty days) and must be currently available for work. Two additional questions probed specifically into what the unemployed person had been doing to find work, and why he could not take a job. "Discouraged workers" (i.e., persons who indicated that they were not looking for work because they believed that none was available) were no longer counted as unemployed but as outside the labor force. Persons absent from their jobs during the survey week because they were ill, on vacation, on strike, etc. (but who might also be looking for some other job), were classified "with a job but not at work," instead of "unemployed" as formerly. New questions had been added to ascertain actual rather than scheduled hours of work.

3. For those respondents that reported themselves as self-employed, a question was added to ascertain whether or not they were salaried workers in small incorporated family enterprises.

4. The survey's conceptual base itself had been expanded primarily with a view to learning more about the composition of the labor force and about persons not in the labor force. One of the questions added, in this regard, was aimed at more accurate estimates of the full-time and part-time components of the labor force; another was aimed at eliciting (and clarifying) the reasons for an individual's job search: i.e., whether he was an aspiring labor force entrant, or whether he had lost or quit his job, and so on.

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[7] See R. L. Stein, "New Definitions for Employment and Unemployment," in *Employment and Earning, and Monthly Report of the Labor Force,* Vol. 12 (No. 8), 1967.

5. For the first time, certain questions were directed at gathering information on persons currently not in the labor force at all. The questions concerned, for example, when they last worked, what their last (if any) job was (occupation and industry), the reasons for leaving that job, whether they wish to work at present, and their intentions to seek work in the next year if they are not looking for work currently. Such information made it possible to group those persons who were not "employed," "unemployed," or "in the armed forces" in various categories such as "engaged in own housework"; "unable to work"; "students"; "retired"; "voluntarily idle"; "seasonal workers" (who, because of the seasonal pattern of their jobs, were not working during the survey week); "too old to work"; "out of a job and not looking for work" (because believing that no suitable job was available); "inmates of institutions"; and "engaged in only incidental (less than fifteen hours during the survey week) unpaid family work." Although the questions directed to those not classified as members of the labor force are asked only when a household is entering the sample for the first time — and when according to the rotation pattern it is re-entering after the "dormant" period of eight months — this expansion of the CPS is an important step toward the manpower resources point of view.

Information disaggregation was another area of concern to the Gordon Committee and on which action was recommended. Disaggregation may proceed along several dimensions, one of which (of particular interest, for example, in connection with the administrative aspects of the war-against-poverty legislation) is predicated on the need for local data, hence for disaggregation of the data along geographic lines. A similar need has been felt generally in economics, and is related to the increasing evolution from macro economics in the large to macro economics in the small — and ultimately to micro economics.

Micro economic approaches to labor force and manpower problems are not new. Much of the early interest in such problems was directed to the micro level in connection with the operations of personnel departments. But government-generated information, intended primarily to assist in the formulation and carrying out of national policy, started on the macro level. It also remained for many years on the levels of highest aggregation, because facilities for processing and presenting the data in any other form were very limited.

Because of the sheer size of this country and the resulting intergeographic variations frequently associated with inter-ethnic and cross-cultural differentials (sometimes referred to as characteristic of a plural society), the numerous layers of manpower problems have no parallel in most of the other developed industrial economies, with the possible exception of Soviet Russia. Once the problems were recognized as arising on such low levels of detail, available manpower information appeared inadequate because it was too highly aggregated. The quest for disaggregated information, especially along geographic lines, had been in progress for some time. The Gordon Report, however, was one of the first major official documents to clearly identify this difficulty and to spell it out.

The most direct approach to the problem, if not the most likely to be fully satisfactory to the data users, seemed to be an expansion of the CPS sample. The recommendation to that effect by the Report was, as noted above, implemented to some extent by increasing the number of the sampling areas and the number of households.[8] Although a most desirable step forward, it was only a small one; reduction of sampling variance, welcome as it may be, of course does not solve the basic problem of obtaining estimates for small geographic areas.

The Report also addressed itself to the question of how to improve local manpower estimates via other avenues. The Committee's interest in the federal-state employment security system as an information source is easily understandable, because of the program's predominantly local focus and orientation. This focus is the strength of the program but (as noted earlier) it is also a weakness. The geographically highly decentralized nature of unemployment insurance activities has posed enormous problems of coordination when such activities are viewed as an information-generating facility.

To produce useful figures, data on "covered employment" must first be obtained by adding to the operating statistics on the number of "insured unemployed" the estimates of the unemployed who are *not* receiving benefits because they have already exhausted them, or because they are disqualified, or because of a variety of other possible factors. To this number must be added persons filing unemployment claims under various other programs, e.g., federal government employees, ex-servicemen, and railroad employees. In addition to workers in "covered employment," there are of course others not covered: employees of small firms and of some nonprofit organizations, domestic workers, unpaid family workers, and some self-employed and agricultural workers. Furthermore, the dividing line between covered and uncovered employment is subject to continuous flux as a result of legislative changes. If labor force totals are sought as the ultimate goal, some estimates have to be prepared on new labor force entrants and re-entrants. Considering that all these data must be obtained for many, and generally small, local areas, the immensity of an undertaking to provide intergeographically comparable information is obvious. There are also problems of differentials in concepts and procedures: employment records refer to the place of employment, and unemployment records refer to the location of the employment office — and neither refers to the place of residence which, in turn, is the criterion in household surveys such as the CPS.

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[8] See, for the earlier sample and its history, U.S. Census Bureau, Technical Paper No. 7, *The Current Population Survey — A Report on Methodology* (1963); and J. E. Morton, *Analytical Potential of the Current Population Survey for Manpower and Employment Research* (Upjohn Institute for Employment Research, 1965).

Although the Bureau of Employment Security has been supervising and extending technical guidance to the labor market analysts in their information-collecting activity, some of the emerging problems are genuinely complex, and not enough is known to provide final answers to all of them. Hence, the Bureau's efforts to coordinate and advise suffer from the same difficulties occasionally experienced by university extension services prior to the conclusion of the research whose findings are to be extended. In the kind of information-generating efforts just mentioned, the problems encountered may involve the study of intergeographic differentials in labor market structure and in composition of the manpower resources base, of cyclical contagion and seasonal patterns, and of what on the international plane would correspond to truly cross-cultural inquiry.

The Gordon Report, in full awareness of the present state of the arts, recommended that more systematic research be undertaken to qualify the issues, mentioning household surveys of "typical" areas, and more intensive, locally oriented study of seasonal patterns.

The absence of sufficiently disaggregated information is in part also responsible for the problems surrounding the area of occupational statistics. For many years, information pertaining to occupation, experience, skill, and ability — in other words, data on the quality rather than the quantity of manpower resources — was primarily of concern to those private sector employers with personnel departments that collected it to keep on file. In the public sector, federal agencies such as the Civil Service Commission, the Department of Defense, and the Draft Boards also collected it to keep on file. The data involved were micro data intended for micro decisions, i.e., for decisions by individual firms or other units.

Only very recently has this information become of importance on macro decision levels for national manpower policy, and for public administration of national and of local labor markets. The growing interest of government in this area, which originally was considered the domain of the market mechanism, was also reflected in the sphere of information. The government's involvement stemmed from factors operating in two opposite directions: (1) the emergence of what was considered a major structural unemployment problem, and (2) the pressure, especially during war and emergency periods, of shortages of scientific, technical, and other highly skilled and specialized manpower.

The first factor led to the crystallization of unemployment policies directed toward training and retraining for the unemployed, with a view to making them more readily employable. The policies were embodied in such legislation as the Manpower Development and Training Act and in such information as the "occupational outlook" data prepared by the Bureau of Labor Statistics. The second factor was manifested in demands for a policy concerning technological and scientific manpower, so that the real (or imagined) competition with some foreign nations could be met. This is illustrated by implementation on highest policy levels of such a policy and in information activity such as the National Register of Scientific Personnel and the special survey system sponsored by the National Science Foundation.[9]

The activities involved with the first factor still had much of the welfare and income-maintenance approach to policy, but those involved with the second aimed directly at the manpower resources problem. The Gordon Report introduced the problem of occupational statistics within the context of its discussion of automation and technological change and the consequent expected decline of employment opportunities for unskilled and semiskilled workers. The point was made that if adequate training and re-education programs were to be planned, (along with vocational counseling) more precise occupational information than was currently available would be needed. The customary source for occupational statistics had been the decennial population census, except for those covering the special and highly skilled components of the country's manpower reservoir. Current intercensal occupational statistics are provided by the Current Population Survey, which suffers from a sample size inadequate for most purposes of occupational statistics, especially when some of the less frequently encountered occupations are at issue. Also, questions on occupation are often difficult to answer, because of the lack of uniform terminology; this difficulty is compounded if, as is frequently the case in household surveys, the respondent answers for other household members.

The Gordon Report, therefore, recommended a general review of the occupational statistics program. The review would include, for example, exploration of (1) employer surveys; (2) the use of local area skill surveys; and (3) use of reports to federal regulatory agencies on the skill composition in the industries within their purview. In conclusion, the Report recommended "that studies begin as soon as practicable in order to obtain information on employment in rapidly expanding industries . . . ," and "that the Bureau of Labor Statistics proceed to implement its proposed program of developing current employment statistics by occupation." In particular, the following questions should be explored: (1) what occupation records are available; (2) to what extent existing data collection programs ought to be supplemented; (3) what sample size and frequency would be required for such industry surveys; and (4) to what extent mail reports of field surveys should be used.

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[9] For a selected list of reports on surveys on employment of scientists and engineers conducted over the 1950-1966 period, see *Employment of Scientists and Engineers in the United States, 1950-1966,* Appendix D (National Science Foundation, 1968). Illustrative are the annual survey of scientists and engineers employed in industry and, more recently, the survey of doctorate degree scientists and engineers in industry — to be combined with those in the educational system and in government service; both these surveys have been conducted by the BLS. To this should be added the health manpower statistics recently being prepared in the Department of Health, Education, and Welfare: see *Health Manpower, United States, 1965-67,* Series 14, No. 1 (National Center for Health Statistics, November 1968).

Another major gap in the information structure that the Gordon Report endeavored to close involved the problem of vacancy data — i.e., statistics on unfilled jobs. The question is closely associated with the problem of disaggregation and the need for occupational information. Vacancy data have been available in many industrial countries for some time. And such information had been collected since the early 1950's in the United States by state employment agencies for about fifteen labor market areas, but a suggested corresponding general program was apparently not of sufficient interest to be implemented by national agencies.

A general mandate to collect such information had been implied in the Employment Act of 1946. However, some fifteen years later, job vacancy statistics were specified as being among the major information gaps, during the December 1961 hearings of the Joint Economic Committee's Subcommittee on Economic Statistics.[10]

Currently, the collection of data on jobs to be filled presents novel problems, in part because there has been little experimentation with it. The measurement problem, for instance, has not had the benefit of the many years of effort that went into the development of measuring techniques to be applied to employment and unemployment. But the basic difficulties stem from the absence of a coherent conceptual framework for analysis of the market, in which vacancies have sometimes been considered as representing the demand side. As long as only the supply side of the market seemed to matter, the difficulties were not too apparent. But when a clear concept of the market mechanism was called for that would accommodate its various components and forces, the need for definitions in operational terms (usable for specifying data requirements and measurement techniques) became very obvious. Accordingly, the Gordon Report recommended that the Department of Labor, which had earlier transmitted to the Committee a program of research in this problem area, actually initiate such a program.[11]

### *Systems-Oriented Patterns of Thought*

Another group of recommendations in the Report devolved around coordination and integration of manpower information. Such coordination can be interpreted in two ways: (1) as a systems-oriented endeavor to enlarge the information base, aimed at what in effect is new information that would not be available if data production is uncoordinated; (2) as an effort directed toward reconciliation of data, including comparison and validation of manpower statistics from different independent sources.

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[10] *Hearings Before the Joint Economic Committee's Subcommittee on Economic Statistics,* 87th Congress, 1st Session (December 18-20, 1961).

[11] The program on job vacancies is reproduced as Appendix B in the Report.

The Report approached the problem from the second viewpoint, to the near exclusion of other considerations. Its entire Chapter IV and parts of other chapters and Appendixes H, I, J, and K were given over to problems of data reconciliation and of validating apparent discrepancies. It should be mentioned, however, that the Committee did not choose the easy road of simply identifying here and there apparent duplications and discrepancies in series assumed to measure the same events. Instead, it undertook a painstaking and craftsmanlike appraisal of the several manpower series. Thus, it came to the conclusion that, by and large, workmanship in the building of major series was satisfactory. For groups which account for conceptual differences, more frequent measurement should be undertaken — for example, in the case of multiple job holders and of the unemployed status of persons who have exhausted their unemployment benefits.

Systems-oriented coordination of information can be thought of as a transitive operation within the system, weaving independent components into a mutually reinforcing fabric. Two such transitive operations come immediately to mind: (1) the linking of records and information, perhaps from the same source, for identical respondents over time; and (2) the matching of records and information for identical respondents from different data sources. The Report mentioned both operations, but only in passing.

However, the importance of having statistics on the work activity of the same persons over a period of several years had been recognized. Also, a recommendation had been made that "matching surveys be undertaken on a selective basis." The matching, however, was aimed clearly at validation and reconciliation of data rather than at enlargement of the useful content of the stored information. A consequence of this approach was the preoccuptaion of the Committee with the data-use question in terms of macro information only, which is reflected in the recommendations (Chapter IX) on presenting labor force information to the public.[12]

In retrospect, the Report is much more than its modest title *(Measuring Employment and Unemployment)* might suggest. It is, in fact, a major stocktaking effort, giving, within the limits of the imposed assignment, as complete a picture of manpower information at the end of the decade that introduced the second half of this century as has ever been available in this country or elsewhere. The limitations are those dictated by the subject matter intended for primary consideration (i.e., employment and unemployment statistics) and by the data sources considered (i.e., major continuing surveys and byproduct data, such as household and employer surveys, and the administrative data from federal-state employment security operations).

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[12] In addition, the Report contains two excellent chapters and four appendixes devoted to problems of measurement, statistical survey techniques, and methods of seasonal adjustment. Since our present discussion is limited to information content, these aspects of the Report are not detailed here.

The Report, which was released by the Committee in September 1962 in the form of a document of respectable size, with ten chapters and twelve appendixes, filling over four hundred pages is, of course, a product of its time, and exhibits the marks of transition which characterized the entire manpower situation of that period.

Throughout the first decade after World War II the labor market had been tight, stimulated by the release of pent-up demand and further spurred on, after a brief recession, by the economic upsurge caused by the Korean war. During the mild downturns after that war, welfare-oriented unemployment policies seemed adequate to deal with the labor market problems of the brief cyclical slump. Mass unemployment was not a major problem.

Only gradually, during the mid-1950's did an unemployment question emerge that seemed to differ from earlier questions. Although not excessive if measured by sheer numbers of people involved, unemployment began to change its complexion. Formerly a problem that, cyclically, permeated the economy as a whole, it now appeared as a selective phenomenon, affecting certain parts of the manpower reservoir adversely, while other segments seemed to enjoy a reasonable degree of employment stability.

These new developments in the labor market seemed especially ominous because they separated the manpower structure into two parts — one of which was excluded from the labor market with no immediate expectation of change or readjustment. A number of factors seemed to be involved in this pathological and politically highly dangerous development: (1) the recent acceleration in the kind of technological innovation labeled automation;[13] (2) rapid sharpening of the race issue that had long simmered under the surface; (3) accentuation of the age-old struggle between the generations, leading to a forcible articulation of opposing emotions and to confrontations which threatened the consensus of society; and (4) the discovery of widespread flaws in the traditional geographic fabric of the economy, tagged as the "depressed areas" problem.

The joint effect of these and similar forces, had, by the beginning of the 1960's, reached the threshold of political concern. By then it was also being realized that the problem might have reached a level transcending the scope of traditional unemployment policy and that the structure of manpower as a national resource was at stake. Hence, what had been considered a "conventional" unemployment issue, began gradually to shift to the newly discovered (or re-discovered) manpower resources problem. The "active manpower policy" was born, and with it the desire for new and different ways to cope with unemployment, which now was being seen as a symptom rather than the underlying source of trouble. With the slogan "from mass to class unemployment," the way was open to new legislation, of which the Area Redevelopment Act of 1961 and the Manpower Development and Training Act of 1962 were outstanding examples.[14]

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[13] The official discussion began in 1955 with the *Joint Economic Committee Hearings on Automation and Technological Change*, and has continued intermittently ever since.

As is frequently the case in similar circumstances, analysis lagged behind hasty diagnosis. The urge to act was apparent long before the urge to provide the data needed for the sober underpinning of valid diagnosis and successful therapeutics. The Gordon Report marks the dividing line, and, contemporaneous with the emergence of the new viewpoint, preceded its full development. However, the Report did anticipate some of the new manpower-oriented information problems — if only indirectly and sometimes haltingly — when it called for research and analysis of the large body of information then being gathered, and for relating the study of unemployment more closely to manpower resources and their underemployment and underutilization.

Mainly, the Report marks the transition from concern about employment and unemployment to concern about manpower more generally. It preceded the changes in emphasis from welfare and income maintenance to use of resources; from attention focused on problems at highest levels to attention focused on lower planes of aggregation; from national to more nearly local issues; and from the stress on macro information to the realization of the significance of micro information.

An immediate consequence of these gradually emerging trains of thought was a recognition of the importance of manpower information not primarily oriented to employment-unemployment. Among such sources of government-generated information on manpower resources are, of course, the decennial Census of Population; the operating statistics of the Social Security Administration; administrative information of the Immigration and Naturalization Service of the Department of Justice; and the various statistics assembled by the National Science Foundation, the U.S. Civil Service Commission, the Department of Health, Education, and Welfare, the Department of Defense, the Selective Service System, and the Veterans Administration.

The population census is, however, the only truly comprehensive source of information on the economic characteristics of the population. Its obvious advantage is its provision of information for the entire population, potentially on any desired level of disaggregation. It can generate truly micro information, comparable in principle for the entire population, including the nation's manpower resources and labor force. Its main obvious disadvantage is its infrequency, which makes it the outstanding generator of bench mark type of data rather than a vehicle for information useful in the observation of short-term changes. The more frequent census of manufacturing produces valuable data on the manufacturing labor force on an establishment basis.[15]

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[14] *Toward Full Employment:* A Report by the Subcommittee on Employment and Manpower of the Committee on Labor and Public Welfare, 88th Congress, 2d Session (1964).

The census data of more direct interest to the manpower analyst — those on the so-called economic characteristics of the population — now include such information on an individual's employment status as: hours worked; number of weeks worked during the year preceding the census; year last worked; occupation; industry and class of worker; place of work; means of transportation to work; and income during the year preceding the census. Among the so-called social characteristics data (other than those routinely supplied in demographic information) of special interest for manpower resources analysis are those on number of years of school enrollment and on number of years completed.

The census schedule presently aimed at ascertaining employment status is quite detailed and precise. For example, an individual is asked whether he or she did any work (other than "own housework") during the "reference week" — i.e., the calendar week prior to the date on which the respondent was interviewed or filled in the questionnaire; how many hours during that week at all jobs if more than one (1-14, 15-29, 30-34, 40, 41-48, 49-59, and 60 or more hours); whether looking for work or on layoff from a job; and whether temporarily absent because of illness, vacation, or other reasons. Thus, it is possible, on the basis of this information, to classify respondents into those who worked at least one hour during the reference week, those who neither worked nor were looking for work but held jobs from which they were temporarily absent, and those not working but looking for a job or on layoff.

Accordingly, the labor force can be conceived of as including those classified, on the basis of their answers to the above questions, as employed or unemployed. The balance of the population (14 years old or older) are classified in the "not in the labor force" group, which also includes persons doing only incidental (less than fifteen hours during the reference week) unpaid work on a family farm or business. The category "civilian labor force" includes those on active duty with the Armed Services or the U.S. Coast Guard; the "experienced civilian labor force" figures include the employed as above defined and those among the unemployed that have had prior work experience.

Qualitative description of the labor force is of particular interest to manpower analysts. This involves information on an individual's occupation, industry-attachment, and "class of worker" characteristics, i.e., private wage or salary worker, government worker, self-employed, or unpaid family worker. Occupations are coded in a taxonomic system of twelve major groups consisting of 297 specific occupational categories and 197 subgroupings.[16] This census classification is generally compatible with the taxonomy underlying the *Dictionary of Occupational Titles*.[17] But the DOT taxonomy is much more detailed, because its primary function is to serve the needs of the process that matches men and jobs. The census, which must rely on self-enumeration or on a not very technical interview (frequently involving a household member other than the one whose occupational characteristics are to be established) is not an entirely appropriate vehicle for obtaining detailed and accurate occupational information of the type that could be ascertained by, say, a trained and experienced placement counselor.

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[15] The first manufacturing census was taken in 1810, and, from 1830, every ten years until 1900; from 1904 to 1919 quinquennially; biannually from 1920 to 1939; and in 1947, 1958, 1963, and again in 1967.

Similarly, the census taxonomy of industries for the classification of respondents by industry in which they work cannot reach the detail of the Standard Industrial Classification on, say, the four-digit level.[18] And even the complete enumerations of a census cannot produce the amount of detail that the manpower resources analyst may desire on the skill and training characteristics of those people who compose the nation's manpower reservoir. In the 1960 Census, for example, persons 5 to 34 years of age were asked whether or not they had attended regular school or college at any time since February 1 of that year and whether the school was public or private (the latter including parochial). Unfortunately for the manpower analyst, the term "regular" was officially interpreted as excluding such types of schools or training as specialized vocational, trade, or business schools, and on-the-job training. The schooling levels were identified on the basis of answers to the question regarding highest grade (or year) of regular school attended, distinguishing between the following five very general categories: never attended; kindergarten; elementary school (grades one to eight); high school (grades one to four); and college for one to six or more years. A subsidiary question attempted to discover whether the respondent actually finished the highest grade or year he attended.

As mentioned above, one of the most serious limitations of census data for the manpower analyst is lack of currency. This is one of the primary reasons for the existence of intercensal sample surveys, such as the Current Population Survey. However, the unrivaled sources of current labor-force information — not as complete in coverage as the population census but very much more sizable than any intercensal sample surveys could hope to be — are the data accruing from the administration of social insurance programs. This point has been stressed several times in our study, but there is no way to avoid its repetition because the U.S. Social Security Administration's files, which cover over 90 percent of paid employment, are by sheer size the single most extensive store of data on the United States labor force. Related programs — such as the systems administered by the Railroad Retirement Board and the U.S. Civil Service Commission — cover much of the remaining 10 percent.

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[16] See listing in *U.S. Census of Population: 1960, United States Summary, Final Report,* PC(1)-1D (1963), pp. 30 ff.

[17] U.S. Department of Labor, Bureau of Employment Security, *Dictionary of Occupational Titles* (revised edition, 1967).

[18] U.S. Bureau of the Budget, *Standard Industrial Classification Manual* (1957). For this census classification see *U.S. Census of Population: 1960, op. cit.,* List C, pp. XXXVI ff.

In administering the old-age and survivors insurance program, the Social Security Administration collects quarterly reports from employers on the number of employees during a pay-period in the last month of a quarter, on the number of employees who worked at any time during that quarter, and on the (taxable) wages earned during the quarter. The Bureau of Old-Age and Survivors Insurance keeps earning records for each and every individual covered by the Social Security Act and its many amendments, an undertaking considered to be the largest bookkeeping operation in the world. As a result of these operations, a wealth of manpower information of considerable importance for analysis has been accruing in the files of the system. The information is important not only because of its continuing and uninterrupted provision (on a quarterly basis for covered members of the labor force) of data on age, sex, and race; employment status; industry attachment; and location of employer by state. In sum, again, the records are an unequaled source of information on the work history of approximately 90 percent of the United States labor force.[19] The history includes interstate migration, industrial mobility, and similar labor-force and manpower dimensions that require information which, for the individual, can be linked from recorded data over time.

The primary purpose of these records is of course to facilitate the operation of the social security system. Information which the system does not consider vital to its operation is not recorded; hence, much of what the manpower analyst would like to garner from this source is simply not there. For instance, an individual's occupation is not recorded, although the data that goes to the system from the individual's place of employment includes the basis for assembling that information.[20]

In other countries, even more comprehensive current records, not subject to the limitation of coverage by successive social insurance legislation, are maintained under the name of Population Registers. Where such registers include data on employment status, occupation, and industry, they are a valuable source for the manpower analyst. A continuous population register has been defined as a "system which will provide for the continuous recording of information about the population in such a manner that data on particular events that occur to each individual, or well selected characteristics describing him, are maintained on a current basis."[21]

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[19] To facilitate manipulation of this mass of data, a sample has been maintained since the beginning of the Social Security System in 1937. For a description of the sample, see J. Perlman and B. Mandel, "The Continuous Work-History Sample Under Old-Age and Survivors Insurance," *Social Security Bulletin* (February 1944).

[20] For other limitations, see Perlman and Mandel, *ibid.* For a description of the records see, for example, Social Security Administration, *Record-Keeping in the Division of Accounts Operations* (June 1962).

Population registers have a long history, going back to the family registers of the Han dynasty in China in the second century B.C., and to the Koseki system of early Japan (seventh century A.D.), according to which records were kept of the members of a family in reference to its ancestral place. Sweden, Switzerland, and Finland have had such registers since the seventeenth century; Hungary since the eighteenth. Belgium, Germany, The Netherlands, and Spain developed them in the nineteenth century. About forty-five countries by now maintain such registers, or similar systems that might be adapted to the collection of population data on a continuing basis.[22] This mechanism for recording population first evoked international interest in the late nineteenth century when it occupied the attention of the International Statistical Congress of 1872, and later the International Statistical Institute (beginning with its 1895 session). The system was considered by the United Nations Statistical Commission during 1956 and has since been explored by the U.N. Statistical Office, which is presently engaged in a comparative study of population registers.

Although population registers are limited at present primarily to administrative and demographic uses, the possibility of easy linkage of the records makes them a valuable data source for such tasks as the reconstruction of segments of biological families.[23] Similarly, the inclusion of information in the register on such items as occupation provides a useful source for cohort-type analysis of, say, occupational mortality and internal migration.

In some respects, the register is comparable to a continuing census. Expansion of the requested information during census years (as for instance in Sweden) yields the equivalent of a census by way of intermittent addition of census schedule questions to the register. With a gradual expansion of computerized information retrieval and comprehensive coding and identification systems, and the use of self-enumeration for the "major" censuses, the conceptual and operating differences between these two vehicles for the generation of population and manpower information have tended to diminish.[24] The register, however, retains the advantage of providing a current inventory. Although the information now produced by register systems stresses demographic characteristics, the practice is being expanded to include economic characteristics of prime concern to manpower analysts. Registers also provide much more current geographical detail and thus a basis for micro observations on geographic and occupational mobility.

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[21] United Nations Statistical Commission (12th session), *Draft Revision of Methodology and Evaluation of Continuous Population Registers,* 5/CN. 3/293 (February 1962), para. 5, p. 3.

[22] For a description of population registers and a discussion of some of the problems, see Ev. Hofsten, "Population Registers and Computers," in *Review of the International Statistical Institute,* Vol. 34 (1966); T. Van Den Brink, "The Netherlands Population Register," in *Sociologica Neerlandica,* Vol. 3 (1965); and E. S. Selmer "Registration Numbers in Norway," in *Journal of the Royal Statistical Society,* Series A, Vol. 130 (1967).

[23] See, for example, *Annual Progress Report of the Scientific Committee on the Effects of Atomic Radiation for 1960* (U.N. Document A/4528).

Although population registers in the exact sense of the term do not currently exist in the United States, there is no doubt that their relevance to certain types of manpower analyses is so marked that the analyses could hardly be undertaken without their aid. However, we do have some register-type collections of records on subgroups of the population whose characteristics are of interest to manpower analysts. These include the National Register of Scientific and Technical Personnel maintained by the National Science Foundation jointly with several scientific and professional associations and societies; the U.S. Civil Service Commission's employment dossiers of federal civil servants; and the records on men aged 18 years and over liable for service under the Universal Military Training and Service Act. That such information is being collected — and often in the greatest detail — does not mean that it is now kept in a form appropriate for manpower resources analysis, or even that it is retrievable.

### *Remaining Information Gaps*

Obviously, there is a current abundance of data that can shed light on manpower problems in the United States, but a good deal of the abundance is still only potentially useful. Furthermore, a number of real information gaps remain. Three of the most important of these involve vacancy statistics, realistic and wide-based data on manpower quality, and local-level data. That such gaps exist at this late date in the history of the art of reckoning, illustrates some of the difficulties manpower analysis has faced in this country.

Manpower analysts, bent on filling voids in the statistical structure needed as background for the government's policy decisions, are frequently guided in their choice of efforts by the degree of success that can be expected for a given effort. This is understandable, since the very existence of a gap usually means that the information involved has presented long-time difficulties. It may entail difficult measurement problems, or call for a very extensive micro level collection effort. In either case, a large expenditure of money and time is usually necessary. Such expenditure is likely to arouse political objections, especially if the specific congressional committees that manipulate the purse strings (1) consider the problem unimportant, (2) can point to other problems more easily solvable, or (3) do not wish to offend one of our pluralistic society's influence groups that may be uneasy about the uses to which the problem solution may be put. (In the following somewhat detailed discussion of the three specific information gaps, the relevance of such difficulties to each of them becomes clear.)

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[24] See "Technical Problems of Setting Up and Maintaining a Population Register by Computer," in *U.N. Conference of European Statisticians, Working Group on Electronic Data Processing* (March 1967).

The Gordon Report devoted part of its Chapter VIII to the vacancy statistics problem. (The Committee apparently received more suggestions about information collection for vacancy data than for any other.) The usefulness of the information has been evident to many manpower specialists for a long time. First, it can round out our knowledge of manpower use patterns — e.g., in connection with underemployment analysis to develop rational programs for vocational guidance, training, and placement. Even more importantly, it can help to illuminate the labor demand side, about which little is known, especially in the United States.

These uses were emphasized during the 1966 conference organized by the National Bureau of Economic Research to discuss problems of measuring and interpreting job vacancies. Attending the conference were representatives of the several countries (among them Canada, France, Japan, The Netherlands, and Sweden) which have for some time maintained programs for collecting and analyzing vacancy data.[25]

In the countries that collect vacancy data, the primary information sources are the administrative machinery of employment offices or of special-purpose establishment surveys, i.e., so-called "employer" surveys. None of the data collection systems, however, provide information which could be considered complete. Also, there are problems in defining a job vacancy: for example, should only "permanent" vacancies be considered — or should "temporary" vacancies also be included? Should *all* currently open vacancies be included or only those existing for at least some minimum number of days? Should there be an attempt to gather information on vacancies "in advance," i.e., before they are expected to occur? What vacancy concepts are to be applied when this information is to be used in the formulation of training and educational programs and in the estimation of the incidence of developing labor shortages? How is one to cope with the complicating effect of vacancy data on job classification for the internal labor market and the so-called "ports of entry to the enterprise" practice?[26]

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[25] For descriptions of these programs, see National Bureau of Economic Research, *The Measurement and Interpretation of Job Vacancies* (Columbia University Press, 1966).

[26] For "port of entry" discussion, see prepared statement of John T. Dunlop on the internal labor markets of large corporations, in *Hearings Before the Senate Subcommittee on Employment and Manpower,* 88th Congress, 1st Session (May 20-23, 1963), p. 301. Further discussion before the subcommittee continues on pp. 302 ff.

Despite the numerous difficulties and controversies that surround this area, most of the countries which have been collecting and analyzing vacancy statistics have found it desirable to continue their programs. There is always, of course, the danger of misuse of the data, and this is a factor that has probably contributed to the somewhat hostile attitudes toward its collection in the United States, especially on the part of some elements in the labor movement. (However, it would seem that similar objections could also apply to many other data whose potential for misuse could produce highly undesirable social results.)

The recommendations of the Gordon Committee concerning vacancy statistics were somewhat cautious, mainly consisting of a request to the U.S. Department of Labor to initiate a program of research which the Department had earlier submitted to the Committee for consideration. Concurrently with the Committee's deliberations (and later), other groups began to experiment with the collection of vacancy data and to explore the problem, in part stimulated by the Report and in part independently.

In the summer of 1964, for example, the National Industrial Conference Board (NICB) started an exploratory study on collections of data.[27] The main objectives of the study were clarification of definitions and experimentation with various survey techniques. Shortly thereafter, an experimental program was launched jointly by the Labor Department's Bureau of Labor Statistics (BLS) and the Bureau of Employment Security (BES) on job vacancies. A pilot study of such a program had been conducted by the BLS in 1956, but its consequence was a decision that the regular collection of vacancy statistics seemed at the time unfeasible, because many employers failed to keep consistent records of their vacancies and were therefore in no position to estimate them. The Gordon Committee, because of the increasing interest in vacancy statistics, requested BLS to take a new look at the situation and to prepare another report on the current feasibility of a nationwide vacancy statistics program.[28]

Therefore, beginning in the autumn of 1964, the Department of Labor engaged in a study of sixteen labor market areas covering about 25 percent of the nation's labor force. The study concluded, as the earlier NICB study had, that the collection of vacancy statistics indeed appeared feasible, and that the technical problems of definitions and survey design could be solved. This optimistic conclusion was probably influenced by the fact that the cooperation of the respondent employers had been excellent.[29]

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[27] See John G. Myers' well-documented progress paper, pp. 405 ff., in the National Bureau of Economic Research 1966 Report (cited in our footnote 25 above). See also John G. Myers and Daniel Creamer, *Measuring Job Vacancies* (National Industrial Conference Board, 1967).

[28] See Appendix A, Gordon Report.

[29] See *Job Vacancy Statistics,* Joint Economic Committee, 89th Congress, 2d Session (1966), p. 3.

It is noteworthy that the response rate in the National Industrial Conference Board's survey was 99 percent, whereas in the Department of Labor's survey the rate varied from 60.2 to 97.8 percent (a median percent of 86.4). The NICB suggested that possible explanations for its higher response rate were (1) the reluctance of some employers to report vacancies to government placement officers, and (2) the collection of the NICB information by personal visit, in contrast to the Labor Department's general reliance on mail inquiries. In any case, the two surveys seem to prove that collection of vacancy statistics is now very feasible in the United States.[30]

Attempts to fill the major information gap on the qualitative characteristics of manpower raise quite different problems from those that have confronted efforts on vacancy statistics. The primary objective of vacancy statistics is to obtain a count of such vacancies, whichever way defined; the collection goal is therefore enumeration. Obtaining information on the qualitative aspects of manpower, on the other hand, is predicated on the availability of appropriate measures of the various qualitative traits — an extremely complex matter, and still in an experimental stage.

For some time there has been interest in going beyond a simple head count of persons in the labor force or of categorizing the employed and unemployed by occupation and education. As shown earlier, the so-called economic characteristics used in previous population censuses attempted to do just that, e.g., by superimposing a more or less detailed grid giving the industrial and occupational distribution. This practice generated a variety of taxonomic problems which, as far as occupations were concerned, were clearly identified by the Gordon Report. So voluminous had the literature about the topic become that, in 1965, the Department of Labor published a bibliography — *Sociological Studies of Occupations* — of over eighty pages. In June 1966, BLS published another study on the sources and data concerning occupational employment statistics (BLS Report 305).

To avoid the need for direct measurement, all these recent attempts (and their predecessors) sought to associate "quality" with more readily observable characteristics. Among the foremost have been an individual's occupation, industrial attachment, and his highest (usually formal) educational achievement.[31]

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[30] On the use of such vacancy statistics, see John G. Myers, *Job Vacancies in the Firm and Labor Market,* a Report prepared for the U.S. Office of Manpower Policy, Evaluation, and Research (September 1968).

[31] See, for instance, the impressive effort by the Department of Labor in the development of the *Dictionary of Occupational Titles*. For a description of the related literature, see Sidney A. Fine, "Use of the Dictionary of Occupational Titles To Estimate Educational Investment," in *Journal of Human Resources,* Vol. 3 (No. 3); also reprinted as an Upjohn Institute Staff Paper (1968).

Aggregative information seemed satisfactory when its primary use was in the analysis, on highest aggregative levels, of nationwide manpower-use problems and the economy-wide occupational structure. When the Gordon Report addressed itself to the problem, it suggested that improvement in existing occupational statistics might be achieved through developing *employment* statistics by occupation. The BLS might, for example, collect such data by sending staff to visit a sample of plants in each industry; by extending its own wage survey program; and by exploring the Current Population Survey as a possible source of occupational information that cannot be efficiently obtained through industry-establishment surveys.

But if manpower is viewed as a resource and as a productive input, information on broad occupational categories appears not to be sufficient. Such classification, in spite of its sociohistorical significance when the social structure was not altering rapidly, loses much of its adequacy for direct description and analysis of the quality of labor inputs. In periods of rapid technological change and structural unemployment, with coexistent shortages of highly skilled manpower in the labor market, the problem of training and re-training becomes acute. For example, there is growing interest in such problems as the "production" of manpower — i.e., the development of skills and comprehension of their transferability — and "investment" in manpower.

The classification issue emerges most clearly when jobs are to be matched with men: in other words, when the desired labor inputs need to be conceptually expressed in skill modules rather than in historical job titles and occupational categories. Such an approach is also needed for planning the content of rational training and educational programs aimed at specific skills. However, before collection and statistical analysis of such data can be undertaken, there must first be measurement of the phenomena to be enumerated. Operational concepts and effective taxonomy must be established.

Considerable attention has been directed for some time toward obtaining better understanding of human work performance, but results have not yet reached the level of our comprehension of the "performance" of material inputs. In the earliest part of the twentieth century, personnel selection was usually based on impressions gained from short and only rarely structured interviews, and on equally impressionistic interpretations of references. The resulting information in general did not lend itself to careful statistical analysis, since its format was that of a haphazard dossier. Only gradually did more nearly rational procedures and attempts along the lines of Hugo Muensterberg's "industrial psychology" begin to provide what is now termed "scientific selection psychology."

As noted in Chapter II, the United States took its first major strides toward developing techniques such as aptitude tests during World War I, when verbal and nonverbal tests (Army Alpha and Beta) were applied on a mass basis. This trend, favored by the generally fashionable climate of positivism and behaviorism, continued after the war and culminated in the statistification of selection theory both here and in England. During World War II, considerable pressure was brought to bear on the military to apply modern selection and placement techniques to their manpower allocation problems, and also to subject such problems to operational research analysis.[32]

Much later, the U.S. Employment Service, which had initially concentrated its attention on the unemployment problem, entered the field of aptitude and performance testing on a large scale. It developed its own general aptitude test battery (GATB) which, together with selected performance and other tests, was administered to a large number of job applicants; testing services were also made available by the Service to individual employers and high schools.[33]

However, even when the predictor and criterion problems have been clarified (via testing and validation), there is still a long way to go before reaching a satisfactory operational theory for a quantifiable model which will tie together skill modules and skill requirements.[34] The goal is to relate skill requirements with skill inputs as reflected by the capabilities of individuals. The Summer 1965 conference in Brussels, under the aegis of the NATO Science Conference, presented a summary of the state-of-the-arts as of that time.[35] Later, other experts (among them Sidney Fine) attempted to provide the basis for a model oriented specifically toward training programs.[36]

Fine proposed what may be considered a three-dimensional underlying continuum of skill categories to summarize an individual's or a job's skill profile. The three categories (the dimensions of the continuum) are:

> *Adaptive skills,* which "enable an individual to accept and adjust to the physical, interpersonal, and organizational . . . conditions," exemplified by self-discipline.

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[32] See S. A. Stouffer, et al., *The American Soldier* (Princeton University Press, 1949-55), 4 vols. For a presentation of the "classical" selection theory, see R. L. Thorndike, *Personnel Selection* (Wiley, 1949); for application of operations research analysis, see E. F. Votaw and A. Orden "Personnel Assignment Problem" in *Symposium on Linear Inequalities and Programming* (Reprint of Project Scoop Manual No. 10, Washington, D.C., June 14-16, 1951).

[33] See Richard A. Lester, *Manpower Planning in a Free Society* (Princeton University Press, 1966), pp. 55 ff; also a critical review by the Office of Manpower, Automation, and Training (OMAT), *Aspects of the Demonstration Program of Community Progress, Inc. in New Haven, Connecticut* (U.S. Department of Labor, 1964).

[34] See Sidney A. Fine, "The Feasibility of a Direct Method of Obtaining Manpower Demand Data" (unpublished manuscript).

[35] W. N. Jessop (ed.), *Manpower Planning* (American Elsevier Publishing Company, 1966).

[36] Sidney A. Fine, "Nature of Skill: Implementation for Education and Training" in *APA Proceedings, 75th Annual Convention* (American Psychological Association, 1967).

*Functional skills,* which enable the "individual to relate to things, data, and people"; examples are skills needed to operate machines, analyze data, and supervise people.

*Specific content skills,* which "enable an individual to perform a specific job"; such skills are usually acquired by experience on the job, or through more formal training.

Since, in the operational reality of the application of such a model, the individual person (or job, if skill requirements of a particular job are to be analyzed) must be projected on a definite point or interval of the underlying continuum, the measurement problem appears formidable at this time. But whatever the particular model proposed, the question is not *whether* pertinent information is required, but *when.* (A relatively simple case, whose feasibility was initially doubted, is the graduate record examination.) And one may conclude, with little risk of error, that a traditional classification by jobs — even if the actual and general use of a much more refined DOT could be enforced — is not sufficient to solve the problem posed by contemporary manpower production policies and legislation. Even a refined occupational and educational taxonomy cannot assure an essentially better determination of training programs to fill now-existing gaps of available manpower inputs, nor can it assure more satisfactory matching of jobs and men on a nationwide basis, as required by recent manpower policy.[37] Whatever the final solution, subsequent development of the information structure seems to point toward the much more important role to be played by micro measurements, micro information, and micro analysis.

The third major information gap — the lack of local data — is due primarily to the expense of assembling such data from the many localities in our extremely large country. The information is vital for the administration of that part of recent legislation which addresses itself to the solution of what are essentially local problems. Among the most pressing of these are the issues in urban ghettos and the questions arising in specific labor markets that must be resolved within geographically specific confines.

This gap has been recognized, on occasion, in the legislation that introduces such policies and measures: for instance, specific provision may be made for funds devoted to the information collection that will assist in initiating, administering, and appraising the results of the program. Unfortunately, these expressions of congressional confidence in the power of information have not, as a rule, been matched with an equal interest in the solution of the implied measurement problem. Interest has been even less in making provision for the achievement of comparability and coordination of the data to be collected, so that the frequently disconnected pieces might ultimately be fitted into a major information system.

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[37] See Georgianna B. March (ed.), *Proceedings of the Conference on Occupational Data Requirements for Education Planning, Summer 1965* (Madison, Wisconsin, Center for Studies in Vocational and Technical Education, 1966).

On the analytical side there is also the need, along systems-oriented lines, to ascertain (1) exactly what information is really required to deal with a local-level problem, and (2) which of such problems could also be analyzed by inference from a group of localities and thus reduce the volume of data required.

Because the sheer size of the United States produces information problems not normally encountered by most developed countries, the choice in regard to local data must be made between use of "brute force methods" (for instance, more frequent census-type operations) and use of careful and extensive analyses of interarea similarity and discrepancy in the behavior of the relevant manpower variables. Both methods are expensive (the first method somewhat more so than the second). The refined analysis requires careful planning and considerable lead time and effort; its costs are those connected with implementing local and decentralized measures taken on the basis of centralized policies and legislation — a problem that ought to be carefully considered before framing manpower policy and legislation.

A step in this direction has been taken by the Census Bureau since the issuance of the Gordon Report. The twenty largest standard metropolitan statistical areas have been included in its program of preparing average annual estimates for individual standard metropolitan statistical areas. The Labor Department's Bureau of Employment Security, in turn, has been studying the problem of how to estimate local manpower requirements by states. These and similar efforts to explore the question of how to produce local estimates are praiseworthy.[38] But a more direct solution of the problem must apparently wait until relevant local data from a variety of sources can be assembled in data banks or in statistical information storage-retrieval systems. Such approaches could, of course, bring about a shift in emphasis from traditional expansion of the data base to better management and utilization of already existing information. The effort that will be required to make the data amenable to local exploitation is a very major one (and would transcend the frame of the Gordon Report). Thus, although tentative steps have been undertaken here and there, the problem is as yet very far from an operational solution.[39]

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[38] On the importance of coordinating, also with respect to data, the requirements of local analysis, local policy determination, and the local operating function, see W. Lee Hansen, "Comments on State Programming and Economic Development" in Selma Mushkin, *State Programming and Economic Development* (Chicago: Council of State Governments, 1965).

[39] See, for instance, D. Netzer, "A Metropolitan Statistical Center: Programs and Functions," in *The New York Statistician* (ASA, New York Chapter, April 1965).

In summary, each of the three persistent information gaps discussed above illustrates a different manpower information situation with respect to the remedial action required to fill the gap. The three cases also exemplify different degrees of complexity of various phases in the evolution of information-generating approaches: the traditional expansion of data-collection programs; complex measurement issues; and, finally, recognition of the need for analytical underpinning of the specification of data for estimating sought-after structural parameters. The last-mentioned need, especially as illustrated by attempts to cope with the local data problem, calls for adroit and operative coordination directed toward systems-oriented objectives. These and related issues must be solved before the collection of meaningful data, free from extravagance and careless use of resources, can actually be undertaken.

By the second half of the twentieth century, the complexion of the manpower problem had gradually changed, and certain features have been emerging that differ from those that characterized the pre-Gordon Report picture. The change in emphasis from primarily welfare-oriented to more nearly resources-oriented approaches was not an altogether novel phenomenon. It can be traced back at least to the New Deal period, even though disguised as a mounting concern about productivity. With the passage of the Employment Act of 1946, the goal of economic growth was clearly postulated: the integration of welfare viewpoints with those of the producer and consumer more generally. The concept of manpower — especially skilled manpower — as an essential factor of production to maintain economic growth became a consideration that was of equal importance to the socioeconomic view of employment as an income provider. The function of manpower as a production input was primarily within the sphere of the enterprise and management decisions; the welfare functions, especially in times of emergency, were essentially a matter for public policy. Thus, "manpower planning in the small" had been highly developed by the new management sciences, whereas "manpower planning in the large" remained more nearly suspect, reserved to periods of crises, war, mobilization, and demobilization. Under the circumstances, the earlier observed "factualism" continued to characterize much of the socioeconomic scene, perhaps with an added feature which might be termed "informationalism." Not only was it taken for granted that "facts" are an essential ingredient of any analysis, but some more subtle usages of information became tempting as a means of influencing public opinion, and of serving as a convenient and persuasive idiom for use in the rapidly developing media of communications, including those of the government. Thus, the importance of information for public policy was being recognized, both in framing policy and in persuading others to accept the policy.

The earlier examples of efforts to expand the content and improve the quality of manpower statistics were listed here, not because of their immediate bearing on the manpower situation, but rather to illustrate the wealth of information being collected, for one or the other purposes, relevant to the description and analysis of manpower resources. The problem was no longer the paucity of manpower information, but rather that the many bits and pieces, each of them illuminating only a particular feature of the manpower picture, were not yet efficiently coordinated.

Thus, in the early 1960's, emphasis began to shift from information content and its expansion to better ways of handling information. In other words, improvement and expansion of data input became less important than efficient management of data output.

# IV. The Shape of Things To Come

The shift in approach to the manpower information problem, beginning in the early 1960's, became gradually more apparent in succeeding years, as a number of factors (not fully operative in the period prior to the Gordon Report) emerged that were instrumental in further shaping the change in emphasis. Five of these, which appeared to be especially influential, are discussed below.

1. *Rapid expansion of "active manpower policy" legislation.* A number of the laws enacted during the early part of President Kennedy's "New Frontier" greatly extended the scope and instrumentalities of manpower policy, and thus were referred to as "active manpower policy" legislation. Among them were the Area Redevelopment Act of 1961, which provided for the training and retraining of the unemployed and employed in distressed areas; the Manpower Development and Training Act of 1962, which expanded training programs beyond distressed areas to occupations for which there was reasonable expectation that a demand would exist; and the Trade Expansion Act and the Public Works Acceleration Act — both of 1962 and both attempting to boost employment opportunities in areas of acute or threatened unemployment.

All of the Acts created a sudden need for ready access to appropriate manpower information that was earlier not generally available. Although some of the legislation made provision for generating its own information, there was no effective framework for coordinating and consolidating it. Thus the effort was jeopardized, especially where generally usable regional and local data were to be generated.[1]

Within the context of the new legislative attempts and of the rapidly widening scope of "active manpower policy," the former rather strict dividing line between economic and social viewpoints gradually faded. On the one hand, there were the economics-oriented employment policy concepts, on the other the strongly socially-oriented scope of the "war on poverty" and the antidiscrimination philosophy. This trend also strengthened analytic interest in and concern about racial and other minorities, the "underprivileged" in general, and the many cross-cultural complexities inherent in our pluralistic society.

2. *Increasing heterogeneity of manpower statistics sources.* As of the mid-1960's, the generation of statistical information by and for the federal government was widely dispersed over a multitude of federal agencies. (This scattering becomes even more complex when the contributions of state and local agencies are included.) Multiplicity of sources characterized government statis-

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[1] See Herbert E. Striner, "Research Strategy for Manpower Policy," in S. A. Levitan and I. H. Siegel (eds.), *Dimensions for Manpower Policy: Programs and Research* (Johns Hopkins University Press, 1966).

tics in general, but in no other major functional area has it been as conspicuous as in the manpower field — and especially when the information base was broadened to include both social and economic content. This broadening of the base, accelerated by the impact of a rapid increase in sheer volume of information over the whole field, led to a veritable manpower information crisis. When would-be data users tried to disentangle one of the complex networks of information channels, they might find data on anything from agency housekeeping information to policy analysis on the highest levels of aggregation. Within a network, consistency was difficult to achieve. Data would sometimes seem to overlap and sometimes to leave irksome voids; they might also differ in concept and definition. All in all, they presented large obstacles, even to the initiated and sophisticated analyst.

3. *Interdisciplinary aspects.* Manpower research, throughout its history, has drawn on many disciplines — both those established before it emerged on the scene, and those that emerged later. It has spanned such disciplines as economics and demography; psychology, industrial relations, and industrial engineering; history and anthropology; law and public administration.

Thus, it became an early candidate for interdisciplinary approaches — especially since no recognized single discipline had been reserved for the study of manpower problems. After the initial interdisciplinary vogue had led, in most instances, to shallowness and superficiality, and especially when the hope for "cross-fertilization" seemed threatened by the danger of "cross-sterilization," a tightening of concepts and methods began. This was aided by the appearance during World War II of a new viewpoint called "Operations Research," which emphasized systems-oriented trains of thought.[2] (The emphasis can be traced to the influence of systems engineering, which as its name suggests, was originally concerned with practical engineering problems.[3]) The concept of "system" soon proved to be very useful to other fields of study that had need for unification of widely dispersed components in some form of interaction within an organized whole. Although its renown is possibly less than the general systems theory, brought to prominence in the philosophy of science, its impact on the organization and handling of information has been enormous.[4] Its translation into operating practice became, perhaps more so than any other single factor, of dominant importance to the design of models, blueprints, and techniques governing the new approach to manpower analysis itself.

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[2] See, for example, E. G. West Churchman, Russell L. Ackof, E. Leonard Arnoff, *Introduction to Operations Research* (Wiley, 1956), especially Chapter 2.

[3] For an early but still informative treatment, see Harry H. Goode and Robert E. Machol, *Systems Engineering* (McGraw-Hill, 1957).

[4] See Ludwig Von Bertalanffy, "General Systems Theory: A Critical Review," in *General Systems,* Vol. 7 (1962), pp. 1 ff.; and Kenneth G. Boulding, "General Systems Theory: The Skeleton of Science," *ibid.,* Vol. 1 (1956), pp. 11 ff.

4. *Introduction of planning, programming, and budgeting systems (PPBS).* In August 1965 an important step was taken by President Johnson when he announced to the Cabinet that the Executive Departments were to apply the modern management system of planning, programming, and budgeting to their choice and conduct of programs. This was later implemented and expanded by the Bureau of the Budget, in its Bulletin No. 66-3 (October 12, 1965).

In March 1967, the President carried the directive further in a message to Congress: "This system — which proved its worth many times over in the Defense Department — now brings to each department and agency the most advanced techniques of modern business management . . . [and] is forcing us to ask the fundamental questions that illuminate our choices." He went on to say that each department must develop its objectives and goals, precisely and carefully; evaluate each program to meet the objectives, weighing benefits against costs; examine alternative means of achieving the objectives; and shape budget requests on the basis of such analysis and justify the requests in the context of a long-range program and financial plan.[5]

The basic content of PPB, however, is of course not novel. One of its essential ingredients, cost-utility analysis, had been experimented with for project evaluation by several government agencies for a considerable time. The Corps of Army Engineers, since 1902, and later the Bureau of Reclamation of the Department of the Interior were among the early, if limited, users of what later became known variously as cost-benefit, cost-efficiency, and cost-utility approaches. Another ingredient — performance and program budgeting — had been encouraged by the first Hoover Commission as a means for introducing management concepts into public finance and budgeting.

The importance of the new approach is its emphasis on a multiyear planning and programming process which incorporates and uses an information system to present data in meaningful categories.[6] Essential to such a system is the clear formulation of a mission-oriented program structure which presents data on all the operations and activities of an agency in categories which reflect the agency's end purposes or objectives.[7] The system is supposed "to enable each agency to make available to top management more concrete and specific data relevant to broad decisions." The importance of information to cost-benefit calculus and to program-accounting techniques derives from the systems character of such methods, and from the fact that, in both cost-utility analysis and PPBS, the program, the project, or the individual category usually straddle several conventional fields, disciplines, and agency jurisdictions.

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[5] *The Quality of American Government,* President's Message to the Congress, March 17, 1967; see also Virginia Held, "PPBS Comes to Washington" in F. J. Lyden and Ernest C. Miller (eds.), *Planning Programming Budgeting: A Systems Approach to Management* (Markhem, 1967).

[6] See also the classic work by J. Dupuit, *De la Mesure de l'Utilité des Traveaux Publique* (1844); English translation, "On the Measurement of Utility of Public Works," in *International Economic Papers,* Vol. 2 (London: Macmillan, 1952).

[7] U.S. Bureau of the Budget, *Planning — Programming — Budgeting,* Bulletin No. 66-3 (October 1965), Section 4.

Under PPBS each department is expected to develop its goals and objectives precisely and in specific terms; within this framework individual programs must be evaluated, comparing their costs with expected benefits (hence the reference to cost-benefit analysis); finally, alternative possibilities to achieve the particular objective must be considered to establish which among several options produces the desired benefits at minimum cost (hence the term cost-efficiency calculus).[8] In operational terms, the pivotal task thus becomes the attempt to express, hopefully in quantifiable terms, "nothing less than . . . the ultimate objectives of the federal government as they are realized through operational decisions."[9]

A more cautious and less sanguine approach, willing to compromise on a partial system and on suboptimization, would seem considerably more realistic. But the beginnings have been made, and the system has now been expanded from its early limited application to problems of national defense to other parts of the Executive Branch. The resulting pressure on expanding the information base needed to supply the "programs" — in other words, the formulation of ultimate goals of many interdepartmental activities — has become truly extraordinary.

This has also been recognized by the supporters of the method. For example, on the first page of Novick's preface to the RAND study (see our footnote 9 below), the complexity of the problem is discussed. The statement is made that "while it is indeed difficult to reduce these matters . . . to simple issues, a great deal can be done to improve the basis for decisionmaking." One first step might be "improvement in the methods of framing the problem and *organizing the available data.*" (Italics are ours.) Thus, from the very beginning, the data question was made a central issue, and much of the subsequent implementation directed itself to these problems.[10] Foremost among the problems was the integration of data coming from a wide variety of sources and their arrangement in the form of comparable data elements which could be used for modular coordination, so to speak, of the needed information. For the first time, systems-oriented considerations of information were introduced into the management of government agencies as an obligatory responsibility.

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[8] Lyden and Miller, *op. cit.* (see our footnote 5 above).

[9] Melvin Anshen, in the RAND study, David Novick (ed.), *Program Budgeting: Program Analysis and the Federal Budget* (2d edition; Harvard University Press, 1967), p. 18.

[10] See, for example, U.S. Bureau of the Budget Circular No. A-86, *Standardization of Data Elements and Codes in Data Systems* (September 30, 1967).

Manpower programs were directly affected by the new administrative policy. They were as a rule long-range programs, overlapping several agencies' activities. They required very substantial outlets and alternative channels, and they required data that rarely ever, if at all, could be found in a single agency bureau, or management unit. Within the present context, it is noteworthy that most examples illustrative of the new approach come from the field of manpower policy and analysis, from education and training projects, and from employment programs. The affinity of such programs with capital investment projects, which furnished the major starting point for classical cost-utility analysis, found its expression in the newly expanding usage of the term "manpower investment" problems.

5. *Labor market mechanisms.* The traditional labor market mechanism which, ever since the time of the French Revolution, had been the main vehicle for matching jobs and men and which had generated its own information, has long been suspected (and often accused) of not performing its functions properly and efficiently. The whole history of public employment services reflects misgivings about the actual role of the "free" labor market. The experience of early trade unions points in the same direction, and so does the development of "internal" labor markets of large corporations and government agencies, and of the ensuing "port of entry" problem.[11]

The public employment services of both the federal government and the states were attempts to supplant the traditional mechanism that had matched jobs and men. But it was soon realized that these services "had not been supplied with the kind of information needed for intelligent planning."[12] Soon, too, it became clear that the information requirements for a nationwide placement service, whatever its advantages, were of a much higher order of magnitude than those for the operation of the traditional labor market mechanism. To establish an efficient and timely information structure of such magnitude would call for systems-oriented information generation, based on a nationwide communications network using the most up-to-date computer technology.

Large private corporations had also been facing the problem of finding new mechanisms to match jobs and men. Their personnel departments had for a number of years been exploring a series of new disciplines and fields of analytical effort — such as industrial psychology, more direct personnel administration and recruitment, and various new techniques of personnel selection, job and salary evaluation, and employee merit rating. All of these efforts were interrelated in that, to a large extent, they were fed by analysis of essentially similar and often identical micro data. The volume of information to be processed for systematic recordkeeping led to early examples of computer use to digest the information.

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[11] The Japanese Nenkoh system illustrates a similar pattern of personnel selection by trial and error, rather than on the basis of detailed prior information. Accordingly, the large firms have primarily hired high school students to be trained on the job, who form the basis of the permanent work force, and expect (and are expected) to be lifetime employees of the firm. From this nucleus, higher positions are filled from "within" the firm's personnel resources, relying on appraisal of the employee's actual performance on the job. (The workings of the system are discussed in some detail in a later section of this chapter.)

[12] Richard A. Lester, *Manpower Planning in a Free Society* (Princeton University Press, 1966), p. 53.

Later, with the increasing scope of the public employment service, similar problems entered the sphere of government concern. The number of jobs and men to be matched and their wide geographic and functional dispersion called attention to the benefits to be derived from more efficient and systems-oriented data manipulation. However, problems were encountered in regard to the recording and prior quantification of the selected characteristics, especially when (1) the variables involved were to be used as indicators of motivational and skill components in a person's expected performance on the job, and (2) the characteristics of particular jobs and their requirements were to be ascertained and ultimately measured. Furthermore, when the two processes — the measurement of a person's expected performance and a particular job's skill/attitude requirements — had to be joined and expressed perhaps in the form of scores and profiles, the further question arose of validating the suspected relationship between predictor and criterion.

This is a difficult task, to say the least, necessitating the development not only of a valid and operational taxonomy but also of its ready communicability to others directly involved in the man and job matching decision — whether prospective employers or employees. To the extent that all these efforts are aimed at "improving" the functioning of the market mechanism, they have been likened to attempts to provide the purchaser of a second-hand car with objective measurements and indicators of the expected performance of the car as a substitute for subjecting it to a road test.

Although remarkable progress has been made during the past decade, much still remains to be done. There are of course many instances (e.g., in the area of scarce and highly specialized personnel, and, at the other extreme, in jobs which call for little skill or other requirements) where even an imperfect device seems acceptable for lack of anything better. However, whether the ultimate solution of the problem turns out to be more or less acceptable, there now seems to be a clear understanding that manpower decisions, to be successful in the marketplace, must be supplied with much more than macro data. Information is urgently needed on the elusive and difficult-to-measure manpower and job characteristics available on the lowest levels of aggregation, i.e., in the form of micro data.

In retrospect, it appears that the Gordon Committee period marks the transition from the quest for more and better manpower facts to the call for more efficient management of the facts; it also marks the shift to the question of how to improve usability of data that in principle were already being collected.

In manpower statistics, the answer depends on the present state of available information technology and on qualified opinions on this issue as expressed by persons or groups which might be instrumental in the development of an actual manpower information system. On the technological side, there are the recent developments in computer sciences, a necessary but not an all-sufficient condition for the creation of an efficient manpower information system. In addition, there is the problem of applying electronic data-processing to the specific aspects of manpower information storage and retrieval.

## *The Need for Statistical Information Storage and Retrieval Systems*

The first steps in the development of information storage and retrieval systems were undertaken with a view to the manipulation of scientific literature and abstracts. Seen in this perspective, the problem seemed to be one primarily concerning the librarian. However, by the 1940's, it had become acute, largely because of the rapidly increasing rate of publication. The situation was summarized in 1945 by Vannevar Bush, who saw the difficulty not so much as undue publication, "but rather that publication has been extended far beyond our present ability to make real use of the record."[13] Three years later the first major international conference was held on this problem. It opened the way to the systematic study of literature search and information retrieval as a specialized new field, including, in addition to the technological problem, the question of how to codify and index publications and abstracts for use in machine-readable form.[14]

Only later did the question arise of such services to scientists as abstracting and data archives — or data banks as they are now usually termed if statistical data are involved. The phrase "information crisis" was more and more used to characterize the plight of the scientist, and especially of the social scientist confronted by interdisciplinary problems in his attempts to keep abreast of new literature and data.[15] In view of the uniqueness of most social science data and the high cost of processing them, the possibility of sharing available data for the purpose of secondary analysis became of great interest to the scientific community.

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[13] V. Bush, "As We May Think," *Atlantic Monthly*, Vol. 176 (1945), pp. 101 ff.

[14] Royal Society Scientific Information Conference, *Report and Papers Submitted* (London: Burlington House, 1948).

[15] H. Menzel, "The Information Needs of Current Scientific Research," *Library Quarterly*, Vol. 34 (1964), pp. 4 ff.

University data banks were soon being created, usually for materials collected by their own research centers, in this country and in Argentina, France, Finland, Germany, The Netherlands, and Norway.[16] Each of the university-sponsored activities usually addressed itself to the problem areas and the information that were of interest to its own research centers. In 1964, a Council of Social Science Data Archives was created in the United States. A voluntary association of individual data archives, it was supported by the National Science Foundation and proposed to serve as a clearinghouse for information on and experience with the problem of retrieving and analyzing social science data by computers. However, the possibility of a nationwide data center was approached only haltingly and cautiously.[17]

### *Facing the Issues*

Among the first attempts to face the problem squarely and directly were three reports reflecting the position of the research community. One was sponsored by the Social Science Research Council; the others emanated from the government. Because the three together illuminated for the first time and from different directions the salient issues and problems of a *statistical* information storage-retrieval system (as contrasted with the earlier literature and document storage and retrieval), each of them is discussed below in some detail.

*The Ruggles Report.* The idea for the SSRC-sponsored report originated at the end of 1959 when the American Economic Association's executive committee formally recognized the great importance of systematic micro data collection for research in the social sciences. A year later, the SSRC appointed six well-known economists as members of a "Committee on the Presentation and Use of Economic Data."[18] Since the chairman was Professor Richard Ruggles (of Yale University) the group inevitably became known as the Ruggles Committee and its final report as the Ruggles Report.[19] The Report's major recommendations were: (1) that the U.S. Government establish a federal data center; (2) that procedures be set up for the development and presentation of important data; and (3) that research institutions and universities — envisaged by the committee as the primary data consumers — develop an organization for coordinating their requests for economic data.

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[16] See Robert E. Mitchell, in *International Encyclopedia of the Social Sciences* (1968) Vol. 7, pp. 305 ff., and literature there quoted.

[17] See *Social Science Archives in the United States* (Council for Social Science Data Archives, 1967), and literature there quoted.

[18] Since the focus of attention was on the field of economics in particular, it is of interest to note that, in the committee's final report, an "initial inventory" of machine-readable data held by a number of federal agencies (presented in an appendix), showed about 25 percent of the nonagricultural items listed to be of direct concern to the manpower analyst.

[19] Other members were Richard Miller (Secretary), Edwin Kuh (MIT), Stanley Lebergott (Wesleyan University), Guy Orcutt (University of Wisconsin), and Joseph Pechman (Brookings Institution).

In the Report's probing of possible frustrations with which a data center might need to cope, two problems loomed especially large: (1) finding a legitimate bypass of confidentiality policies and practices; (2) finding a vehicle to coordinate the large amounts of information that pertain to identical or related economic units but result from different collection activities. Both obstacles are ultimately traceable to (1) the working of a highly decentralized statistical system; (2) the absence of (and perhaps impossibility of creating) identical disclosure rules and practices by all data-generating agencies; and (3) the almost exclusive reliance for information communication on publication programs, which obviously vary according to a specific agency's major responsibilities and mission. A closely related problem is the absence of an overall reference function that would encompass data resulting from the collection and administrative activities of a large number of different agencies and bureaus. Seen from this point of view, the function of a data center appears as a remedial action directed to combat some of the shortcomings of decentralization.

In its Part II, the Report discussed the role of research institutions and universities and the demand for information. The increasing importance of micro data is stressed, especially in view of its presently much more feasible analysis with the use of electronic data-processing equipment. If the potential of the computer is to be fully realized, two overall organizational focal points are needed: on the supply side, the data center; and on the demand side, a continuing coordinating organization to serve as a clearinghouse for data requests, from universities, research organizations, and other organizations. The federal data center, on the other hand, would be established by the federal government "to preserve and make available to both federal agencies and nongovernment users basic statistical data originating in all federal agencies." (Ruggles Report, page 18.)

Other federal statistical agencies have, of course, the ability to handle and process statistical data, but they lack the authority to obtain each other's records. The Office of Statistical Standards does have supervisory and coordinating authority, but is not an operating agency. It was established as a result of a Hoover Commission recommendation to cope with the problems of statistical dencentralization.[20] And although it had lead to considerable improvement, "the federal statistical system continues to operate on a highly decentralized and uncoordinated basis."[21]

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[20] F. C. Mills and Clarence Long, *The Statistical Agencies of the Federal Government: A Report to the Commission on Organization of the Executive Branch of the Government* (National Bureau of Economic Research, 1949).

[21] From a statement made by Richard Ruggles before the Joint Economic Committee's Subcommittee on Economic Statistics, May 17, 1967.

*The Dunn Report.* Stimulated by the Ruggles Report's recommendations, the U.S. Office of Statistical Standards had already begun to undertake its own evaluation. It retained the services of Edgar S. Dunn (at that time with Resources for the Future, Inc.), under whose direction the report was prepared.[22]

The Dunn Report (as it is usually called) appeared to agree with the general position expressed by the Ruggles Report, but it is more specific in the elaboration of its diagnosis as well as in its therapeutic conclusions. In common with the Ruggles Report, it identified a major part of the entire problem as being a consequence of the structure of the federal statistical system. It therefore chose to stress instrumentalities for partial solution, but it fully realized that a radical solution of the problem would involve the data production or input side as well as data use or output. It also implied skepticism about the current applicability of the 1949 Mills-Long conclusions in terms of an optimum solution of present problems (see footnote 20 above).

The Dunn Report, furthermore, was doubtful of the sometimes expressed expectation that the problem may be solved simply by creating a storehouse for the desired information, albeit on a machine-readable medium; it therefore rejected the "naive data bank" as an answer. It looked for the solution in the direction of much more complex applications of the new technology and systems-oriented patterns of thought. For example, to enable flexible associations of numerical records — the objective of a statistical information retrieval system — production of comparable "building blocks" or information modules must first be achieved before the problem of associating them with others and of retrieving the newly created information and insight can be approached. Only then would the desired aggregation or reaggregation of the finely disaggregated elements become practical, so that such an information system could be used as an effective bypass of the many confidentiality restrictions applicable if identifiability of basic records on individual respondents is to be avoided. Records on particular respondents from a great variety of different sources could then be matched — an important consideration where relations are to be traced longitudinally or where fuller cross-section analysis is attempted. Because of the wide dispersion over many independent agencies or many sources within the same agency, this aspect is of the greatest significance for the manpower analyst: it is analogous to the unearthing of new information without the need for collecting new data, simply by making more efficient use of what "in principle" is already available.

To remedy the primary and secondary pathologies resulting from the unsatisfactory operation of the statistical data system, the Dunn Report, therefore, saw the basic functions of such a national center as being:

1. Management of file storage.

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[22] *Review of Proposal for a National Data Center,* Statistical Evaluation Report No. 6 (Office of Statistical Standards, 1965).

2. Provision of a central referral and reference source for statistical data users.
3. Provision of explicit facilitating services, including record matching and disclosure bypassing (by auditing the information and tabulation for release).
4. Development of computer software, as well as hardware, for file management and servicing.
5. Furnishing staff support for the development of standards and of research capabilities aimed at analytical evaluation of user requirements.

To differentiate these objectives from those of a simple tape repository, the Report referred to the proposed center as a "national data service center."

*The Kaysen Report.* When the Dunn Report was completed, the second government-sponsored report was initiated, with the appointment of a task force (headed by Carl Kaysen, of the Institute for Advanced Studies, as chairman), which was asked to consider "measures which should be taken to improve the storage of and access to U.S. Government statistics."[23] However, when the final report was submitted in October 1966, its introduction stated explicitly that the task force members had found the essential problem to be much wider than its definition in their original assignment. It was their judgment that measures "to improve the storage and access to" government statistics would actually involve consideration of the organization and operation of the federal statistical system as a whole.

They had arrived at this conclusion, in part, because of the continuing dispersion of the government's statistical activities, and because of the widespread suppression of micro information, resulting from different classification systems and unit definitions in use by different agencies (i.e., an agency will, as a rule, assemble the data it collects in summary and aggregative form to serve its specific mission-oriented purpose). Finally, the confidentiality restrictions (as interpreted and practiced by different agencies) act as an obstacle to the full use of data for statistical purposes. One of the immediate victims of this decentralization and divergence is manpower analysis, which depends on the use of carefully coordinated and compatible information now accruing in a number of independent agencies and other producers of statistical data and by-product data.

In particular, the Kaysen report pointed to three major inadequacies of the statistical system as presently operated:

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[23] Other members of the task force were Charles C. Holt (University of Wisconsin), Richard Holton (University of California, Berkeley), George Kozmetsky (University of Texas), H. Russell Morrison (Standard Statistics Company), and Richard Ruggles (Yale University).

1. The lag between the receipt of information and its availability in usable form.
2. The statistical machinery's widespread suppression of micro information — which constitutes the statistical building-blocks — and hence the failure to make usable all the potential information contained in the collected data.
3. The considerable unevenness in the character and enforcement of disclosure rules as practiced by the various information-generating agencies.

To cope with such inadequacies and deficiencies, the committee proposed the creation of a national data center. The center would undertake the storage of all large-scale systematic bodies of demographic, economic, and social data resulting from the collection and administrative activities of the federal government. It would also integrate the information, to the maximum feasible extent while still preserving as much as possible of the original data content, and provide ready access to information within the laws governing disclosure.

Although the three reports differed in their philosophy and in the detail of their recommendations, they arrived at similar conclusions — both diagnostic and therapeutic — concerning the major aspects of particular significance to the use of manpower information. Thus, they seemed to agree on the importance of providing the statistical organization with a systems-oriented viewpoint, and of implementing it with a workable statistical information storage-retrieval system. The particular strategies for reaching this objective varied, but all of them appeared to be in accord as to the central importance of basing such a system on individual information "building-blocks," to be assembled and reassembled into groupings and aggregates best suitable for the envisaged analysis.

Seen from the manpower point of view, such a system could mean real progress for the field of manpower information, and provide a decisive step toward overcoming two of the field's most irksome problems. The first is the wide dispersion of the present data base, i.e., the sources of manpower information. The other is the complex and involved manpower decision structure for which information must be furnished. The decision centers range from the highest policy levels (concerning the entire nation) to local levels (dealing with operating problems). The broad spectrum of varying subject matter that they span requires for its analysis the whole gamut of statistics from conventional economic to much less well-developed social statistics.

The benefits derived by the manpower analyst would include: (1) the new information created by the matching and linking over time of micro blocks, generated by different complementary information sources and by different time-sequenced surveys where longitudinal studies are to be undertaken; (2) the disentangling of relationships between micro blocks, free from linear assumptions so frequently made in the study of relations between macro data describing large aggregates; and (3) the use of simulation approaches requiring as inputs micro data — for instance in tracing effects of minimum wage legislation or other contemplated policies too complex to reveal their consequences through straightforward application of classical macro models.[24] Introduction of a data storage-retrieval system of this nature would also help in obtaining geographically disaggregated information for use in the study of local areas and local labor markets. This would bring nearer to realization attempts to edit and plow into an overall statistical storage-retrieval system the presently awesome volume of non-federally generated local information.[25] In addition, as pointed out earlier, the existence and judicious operation of an overall information system could gradually contribute to the protection of privacy of information. Since disclosure rules for the protection of individuals could be applied to the newly aggregated information *output* only, and not to the micro *input*, which therefore need not leave the system at all, a legitimate disclosure bypass could now be provided, shielding identifiable individuals from "privacy invasion" more uniformly and more securely than heretofore. (Dossier type of information on individuals is excluded from the system by all three reports.)

Overall "position papers," such as the three reports discussed above, help to gauge the general trends of development, as well as the prevailing climate of qualified opinion and attitudes with respect to the desirability of statistical information storage-retrieval systems. However, the actual state of affairs can, of course, be gleaned more fully from a sketch of the functioning and problems of the current statistical information technology. Before discussing some of the actual operating systems, it may be beneficial to touch upon some of the technological elements of any statistical storage-retrieval system. These illustrate the kind of problems students of such systems encounter, especially because the technology is still very young.

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[24] In his statement to the Joint Economic Committee's Subcommittee on Economic Statistics, May 17, 1967, regarding coordination of government statistical programs, Professor Ruggles pointed to examples in which micro analysis provided results that were different from and better than conventional macro analysis. Among the examples were such problems as the important manpower-oriented measurement of changes in productivity and the evaluation of the consumption function, both of which require examination of individual behavior.

[25] See for instance, Intergovernmental Task Force on Information Systems, *The Dynamics of Information Flow:Recommendations To Improve the Flow of Information Within and Among Federal, State and local governments;* a Report (Washington, D.C., 1968).

### *Problems for the System Designer*

As a rule, a statistical information storage-retrieval system (sometimes referred to as a statistical file system[26]) is usually thought of as consisting of four subsystems, designed to perform the following tasks: (1) data input; (2) data storage; (3) data processing; (4) data output. To have such a system, the essential ingredient — statistical data — must be used in *several* applications and by *several* users. For instance, different users may wish to "access" the same data for different purposes.[27] (Hence the terms "data bank" or "data base" — the latter properly reserved for the file system within the "data bank.")

A national statistical information storage-retrieval system of this kind might be imagined as consisting of a system within which individual units (e.g., persons or establishments) request statistical data pertaining to individual units or to various aggregates (geographical, functional, or others); similarly, such "aggregates" may request statistical information pertaining to individual units or to groups. See information flow chart in Figure 1 on page 94 (adapted from page 3 of Arvas, as cited in footnote 27 below).

Where data are available in machine-readable form on "individuals," i.e., where micro data are stored in the system, it is possible in principle to build up Flows 3, 4, and 6 (Figure 1) from information generated in Flows 1, 2, and 5. Thus, observed micro data can be used, instead of approximations computed from aggregates (i.e., instead of macro information). The potential of the resulting enlargement of the information base has seemed so impressive that, by analogy to water, gas, and computer utilities, the concept of data utility has found its way into contemporary information systems terminology and planning.

Work on theoretical formulation is still in its beginnings and must address itself to the problem (among others) of establishing criteria for systems evaluation and for the organization and management of data files. However, a good deal of thinking has been done along such lines, in this country and elsewhere. For example, the United Nations Conference of European Statisticians, held in Geneva, September and October 1968, devoted much of its program to such issues.

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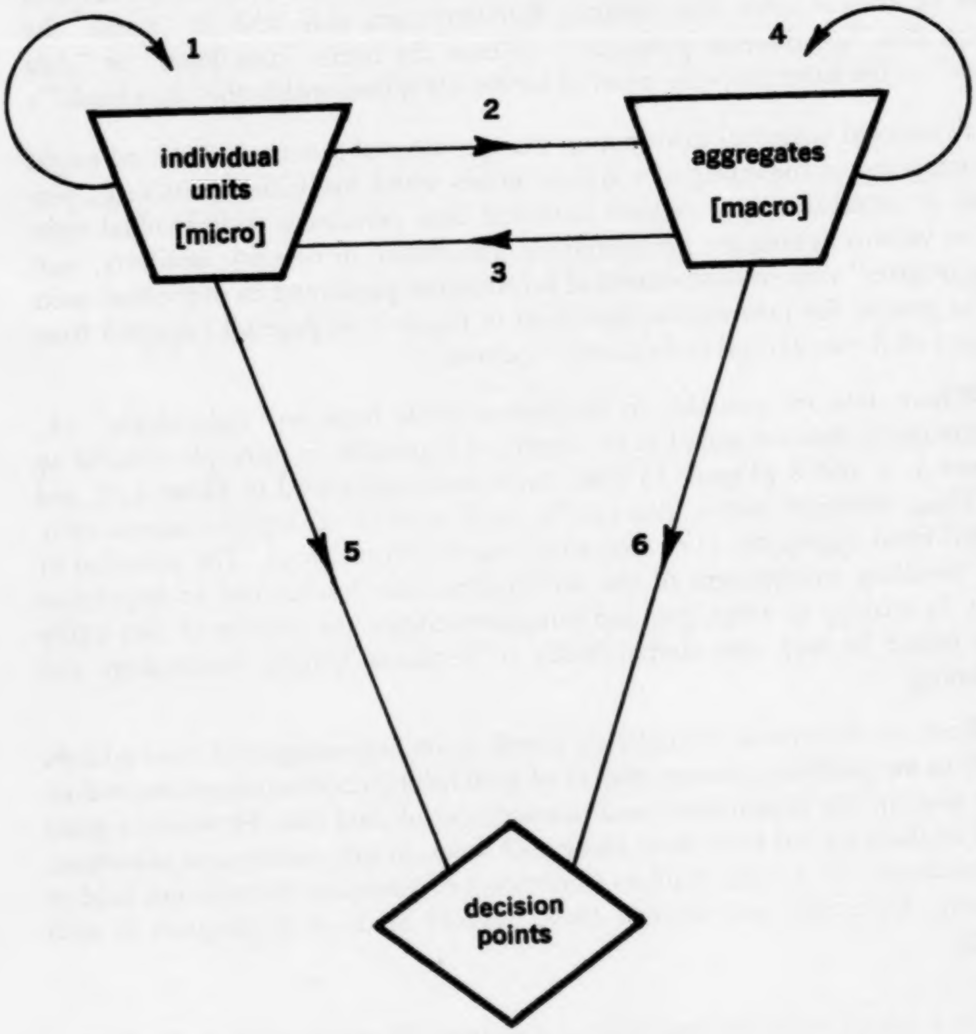
[26] For a general model and description of a statistical file system, see Svein Nordbotten, U.N. Statistical Commission and Economic Commission for Europe (Conf. Eur. Stats. WG 9/52, December 1966), p. 3.

[27] Christian Arvas, in *ibid.*, (Conf. Eur. Stats./WG 9/78, September 1968), p. 5.

## Figure 1

## Information Flow


1
4
2
individual units [micro]
aggregates [macro]
3
5
6
decision points

To give the manpower specialist who is not himself an expert in systems design some general idea of the problems involved, a few illustrative issues are described below.

1. *Criteria for inclusion of data in the system.* Guidance must be provided on how to decide whether specific data files should or should not be part of the storage-retrieval system. The problem is complicated by the possibility that the data files included in a particular system may or may not be kept in the same locality, and that maintenance of a particular data file included in the system may be managed and kept by the "data center" — or by any other organizational unit not part of the data center. Since the reason for the existence of a data center proper is joint usage of its data base by several present or intended users, one straightforward approach is to calculate minimum costs; in other words one might compare the cost of joint usage (for maintenance — including costs incurred by the respondent — and for accessing the data) with the costs to the different users if they themselves were maintaining a "system" of information of particular interest to them. The implied cost-benefit (cost-utility) comparison is further complicated by the information system's capability of supplying the user, via record linkage, with a possibly enormous mass of additional data combinations whose potential is often initially unknown and unsuspected by the manpower information analyst.[28]

2. *The macro-micro issue.* For the analysis of socioeconomic structures and relationships, information is needed on a great number of various and distinct parts of the structure. Many parts of socioeconomic subsystems may be unknown initially to the analyst, and emerge only gradually as his analysis proceeds. In other words, the primary information storage-retrieval system must be flexible, to permit many different potential partitions on various levels and along various dimensions of disaggregation. The analyst may take for granted so-called hierarchial partitioning — that is, a situation where, for any partitioning, there exists a "higher-order" such that the "lower-order" is included in it. An example would be a data base which contains information on the employed and on the unemployed; both categories would be completely included in the higher-order partition "members of the labor force."

But there is also the problem of non-hierarchial partitions. Thus, the lowest partitioning may be well defined (it may be an individual person in the population census or in the current population survey) but information may also be desired on such higher order non-hierarchial partitions as "household" or "family." Even more awkward for the system to handle are situations where non-hierarchial partitions are needed but where corresponding individual units do not exist. Thus, a particular analysis may call for members of the labor force by labor market, by industry, or by some other grouping. No satisfactory systems-oriented, efficient, and "elegant" solution of this problem has yet been found. Cross-referencing and creation of synthetic units for the sake of comparability are some of the devices now used.

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[28] For complex evaluation and costing problems in even a simple model see Arvas, *ibid.*

3. *Linkage and matching of records.* Data in the data base can be used "jointly" by executing two essentially different operations:

1. Numerical manipulation of the data in the data file, mostly through statistical "reproduction." Here the data user "computes" measures from the records in the file or in some part of the file; "computing" may involve simple counting or complex analytical procedures. A specific example could be the computation of mean monthly wages of women under 30 years of age working in the textile industry in three specified labor markets.
2. The data in the file need not be subjected to such "computation," but can be linked to another file or to some part of another file. Linking may take the form of merging two or several files, and of matching records. This operation, which is often the primary objective of a complete statistical information storage and retrieval system, characterizes attempts to complement the records in the first file with information on the same units from records in a second file. Such file use is of particular concern to the user of manpower data.

As stressed by the three reports discussed earlier, a major merit of the proposed data center would be its making possible the combination of information pertaining to a particular individual unit, even though such information may originate in different agencies and result from separate information-generating sources. This capability of a micro information system corresponds to a *de facto* expansion of the data base without an additional burden on data collecting activities. Such extension of the information base is of obvious significance for manpower information and could mark an important step toward providing better and more ample local data through a merging of different records — local, state, and national.

More ample literature is available concerning the development of theory as well as strategy.[29] Although the process of matching records from two files may seem technically simple, it is anything but that. To keep information on individual observations current, an essential operation of the system — in addition to the input (storage) and output (retrieval) functions — is updating of the files. This updating operation is, as a rule, performed by merging the information in the data base (usually referred to as the master file) with the new incoming reference records (the so-called transaction file). The objective is to delete, insert, or change records through the maintenance of an up-to-date and efficient statistical storage-retrieval system.

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[29] The pioneering work here has often been undertaken in connection with linkage of vital records. See H. B. Newcombe, J. M. Kennedy, S. J. Axford, and A. B. James, "Automatic Linkage of Vital Records," *Science,* Vol. 130 (1959), pp. 954 ff.; and H. B. Newcombe and J. M. Kennedy, "Record Linkage," *Communications of the Association of Computing Machinery,* Vol. 5 (1962), pp. 563 ff. For later writings see I. P. Fellegi and A. B. Sunter, "An Optimal Theory of Linkage," *International Symposium on Automation of Population Register Systems* (Jerusalem, Information Processing Association of Israel), Vol. 1 (1967), pp. 93 ff.; Gad Nathan "Outcome Probabilities for a Record Matching Process with Complete Invariant Information," *Journal of the American Statistical Association,* Vol. 62 (No. 318, 1967), and literature there referred to, pp. 454 ff. Also see J. M. Kennedy, "Linkage of Birth and Marriage Records Using Digital Computers" (Ontario: Atomic Energy of Canada Ltd., 1961). Consult also bibliography at the end of National Center for Health Statistics, "Use of Vital and Health Records in Epidemiology Research," Series 4, No. 7 (U.S. Department of Health, Education, and Welfare, March 1968), pp. 10 ff.

The theoretical machinery here involved rests, generally speaking, on probabilistic considerations, since, to arrive at a "best decision," probabilities of three types of errors must be considered while keeping the probability of "no decision" to a minimum: e.g., the probability that information on the new record may be erroneously matched with some record in a master file although it pertains to a case not in this file; that such a "new" record may erroneously *not* be matched with the master file and thus be treated as pertaining to a "new" case; and that a master record relating to a case existing in the master file may be mismatched with another master file record. In other words, the particular decision rule can lead to a recommended "match" for two records which in fact do not match, and conversely to a decision that two records do not match although in reality they do.

The underlying probabilistic patterns are so complex as to transcend the scope of our present discussion here. The problem is pointed out primarily to (1) draw the attention of the manpower analyst to the need for further explorations by systems engineers, and hence to the need for additional lead time; and (2) to stress the importance of assigning a particular number to each individual unit, thus providing uniform identifiers for records resulting from miscellaneous and different sources, statistical and administrative. Such a system of numerical identifiers would, in spite of the occasional emotional objections from some quarters, provide a much less uncertain, much more economical, and much more efficient vehicle for the successful operation of a manpower information storage and retrieval system.

4. *Communications problems.* Two essentially different kinds of data "communications" problems must be considered: machine-to-machine, and man-to-machine. The first becomes particularly important in a large, decentralized information system where arrangements must be made for communications and for data transfer within the system itself. Complex problems arise, especially in the context of optimum systems design. Theoretical principles can often be borrowed from classical communications theory.[30]

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[30] Claude E. Shannon and Warren Weaver, *The Mathematical Theory of Communication* (University of Illinois Press, 1964). See also Arvas, *op. cit.*, pp. 77 ff. (see our footnote 27 above).

The second kind of communication, the one between man and machine, involves the problem of language. For a man to communicate with the system, an interface must be provided for the system and its user that is simple and easy to learn, especially where the system is to serve many different users in different disciplines and in different geographic locations.

Recent trends have been toward a minimum of vocabulary communication with the computer in a so-called conversational mode. But some standard vocabulary, even if not syntax, is required for conveying to the computer the precise information request. The vocabulary, which should be small and close to real language, may be referred to as the data description language.[31] It should include terms for description of "observed" as well as of "computed" data, i.e., for the desired numerical processes to be performed by the system on the specified "raw" data. Since the statistical storage-retrieval system may frequently be used to put the retrieved data into tabular form for further use, an efficient vocabulary is also needed for instructing the system to deliver the data output in a form of specific tabular arrangements. Hence, there is also needed a table-description language to simplify the user's communications with a computer if he desires "formatted" output.

This creation of a vocabulary and language which can be readily acquired by the data user and unambiguously interpreted by the computer is one of the primary implementations of a data information storage-retrieval system. It is as essential to the usefulness of such a system as are coding, indexing, and cataloging of printed material to the usefulness of a library.

Despite the unquestionable progress during the latter part of the 1960's, some of the questions still await adequate solutions. The problems raised are further complicated by the constant flux and improvements of computer technology, and the resulting need for further systems research is itself a cogent argument for the establishment of data centers or of other administrative focal points in which such research could take place. Only in such centers will inquiry of this kind find a permanent home, and only such centers will provide a fertile soil for the orderly accumulation of operating experience, so vital to the search for efficient solutions to the many current and emerging problems facing the information systems-engineer in this period of rapid technological change.

Even though the history of statistical storage-retrieval design has been short, examples of such systems in actual operation can be found, and many more are in their blueprint stage. Significantly, among these first cases, manpower data are prominent.

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[31] See Nordbotten, *op. cit.*, pp. 6 ff. (see our footnote 26 above); also Brian C. Vickery, *On Retrieval System Theory* (London: Butterworth, 1961), and Rudolph C. Mendelssohn, "The BLS Computer Language for Quantitative Economic Research," Address to the Conference on Government Information Systems of the Economic Council of Canada, (Ottawa, October 5 and 6, 1967).

In terms of the above sketched properties of what might be called "complete" statistical information systems, operating statistical information systems are at this time more or less restricted. They are special purpose subsystems rather than fully integrated systems and they are first rather than final steps — and it is remarkable that they exist at all.

A brief synopsis of manpower information storage-retrieval systems may help in forming a judgment as to the potential and workability of this approach to the manpower data problem. For such a summary, it seems appropriate to look at presently operating systems in terms of their restrictions along selected systems dimensions. Accordingly, one might divide the selected examples into "matching" and "general" manpower systems and the "matching," in turn, into internal and external ones. "General" systems may be classified, according to the domain (geographic and functional) over which they are intended to operate, into national and subnational, and, according to the smallest information units they contain, i.e., the lowest level of partitioning that can be performed, into micro and macro systems.

The first installations of computerized manpower information systems were undertaken by the managements of large private corporations and large government agencies; their primary objective was to modernize and streamline work of their personnel departments. Especially in large organizations, the numbers of personnel files and job applications had reached such dimensions and the problem of matching jobs and workers had become so complex that use of electronic computers seemed the only solution.[32] In 1966, the National Commission on Technology, Automation, and Economic Progress recommended that computerized nationwide service for matching men to jobs be established.[33]

Much thinking had been done on such a nationwide system and the United States Employment Service had retained a group of outside consultants to assist in its design. Although no actually operating overall system does as yet exist in this country, examples of matching systems on subnational levels in private business and in government agencies, or of geographically unrestricted systems limited to special manpower categories can be found. Early in 1967, a workshop was held by the Industrial Relations Section of the Sloan School of Management at MIT under the direction of Professor Douglass V. Brown to explore computer-based job-matching systems and the proposed establishment of a nationwide system for matching people with work opportunities.[34]

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[32] See Charles C. Holt, "How Helpful Can Computers Be in the Search of Jobs and Employees?" in Neil A. Palomba and Edward B. Jakubauskas (eds.), *An Interdisciplinary Approach to Manpower Research* (Industrial Relations Center, Iowa State University, 1968), pp. 197 ff.

[33] *Technology and the American Economy*, Report of the National Commission on Technology, Automation, and Economic Progress, Vol. I (February 1966), p. 70.

[34] *Workshop on Computer-Based Job Matching Systems* (MIT, Sloan School of Management, 1967; transcript).

### *Examples of Presently Operating Systems*

Most of the systems were primarily internal, i.e., directed to the internal labor market of the companies and of government organizations. All of them, by the very nature of the information, were micro systems; only a few were nationwide in coverage. Their domain was limited to specialized and selected manpower groups and were, as a rule, external systems. So also were the so-called area labor market systems, among which the best known is the Labor Inventory Communication System (LINCS) of the California State Employment Service in cooperation with the United States Employment Service.[35]

Among the now operating external and (in principle) nationwide systems, are the personnel information communication system (PICKS) operated by Western Union, and GRAD (for graduate resumé accumulation and distribution), the system of the College Placement Council. PICKS, designed by Information Science during the mid 1960's to match the skills of professional people to specified jobs, aims at a target population of over 4 million. Its objectives are to assist in job matching and to serve professional people in self-assessment for career planning. It also provides regular salary analysis reports to its subscribers — individuals as well as companies. The College Placement Council (headquartered in Bethlehem, Pennsylvania) is a service-oriented non-profit organization with a membership of about a thousand colleges and universities. It receives candidates' resumés, in the great majority of cases through the placement director of the applicant's college. Prospective employers can in turn request names of candidates whose resumés meet the employer's requirements by simply forwarding to the GRAD data center a "search configuration" using a standard set of "dictionary" terms.

This very brief summary of some of the presently operating job-man matching computerized information systems suggests that their contribution to manpower analysis could be considerable, especially if a nationwide system including external markets, such as the planned United States Employment Service system, could be put into operation.

On the other hand, the several matching systems in operation in the personnel departments of industry and government are designed to suit management's need to select employees, and to assess the manpower capabilities of a company or an organization. They are not designed to help people find jobs. This one-way nature of most of such "matching" systems substantially limits their usefulness as overall manpower information systems. The lack of generally accepted descriptors — descriptors of people as well as of jobs — is one symptom of the limitation of such "partial" systems. This applies also to the nation's single largest employer, the Federal Government of the United States whose procedures, especially with respect to its internal market (i.e., to other than entry-level jobs), vary from agency to agency.[36]

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[35] For a brief description see *ibid.*, pp. 154 ff.

The manpower analyst is interested in these limited matching systems primarily because of their possible usefulness as a proving ground for systems analysis. A remarkable example of such usefulness was of course the U.S. Defense Department's massive and often imaginative effort to apply the system to the problems of personnel selection and assignment. For the less spectacular and successful partial systems, however, there is a hopeful possibility. They might be woven, as modularly coordinated elements, into an overall structure — or (more realistically) into the description of specialized manpower components, provided the coverage by the system can be improved.

The foremost and, to the manpower analyst, the most attractive feature of the man-job matching systems is the wealth of micro information they contain, down to the lowest level of information on individuals. But, nationwide, no manpower information system is currently in working condition for other than highly specialized and selective manpower categories.

### *The Japanese Labor Market Center*

Japan's Nenkoh system (see our footnote 11 above) is in very good working order. Its example may be useful to manpower analysts in the United States, because (1) the functions of this centralized and nationwide system include general statistical analysis, as well as retrieval of information needed in the administration of unemployment insurance and in the matching of jobs and men, and (2) its carefully planned functional expansion is illustrative of problems and strategy regarding the phasing of various labor market information functions into a single, centralized micro system.

The Labor Market Center was established in July 1964, under the Ministry of Labor's Employment Security Bureau, to serve as a centralized manpower information system.[37] The immediate reason for the introduction of the computerized system was the immense workload resulting from a change in the manner of computing unemployment benefits. Prior to the several recommendations made by the Prime Minister's Advisory Council on Social Security in 1962, unemployment benefits had been determined by the length of employment on the last job prior to unemployment. The policy recommended in 1962 favored aggregating the periods of employment, even if by several employers; thus, the new benefits were to be based on an individual's periods of employment by all his employers prior to the loss of job. The workload resulting from the need to aggregate separately for each qualified person his successive employment periods exceeded the clerical capability of the more than 500 Public Employment Security Offices (PESO), especially when persons moved from the jurisdiction of one PESO to that of another.

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[36] See *ibid.*, pp. 109 ff.

[37] *Employment Policies of the U.S. in Japan,* Report of the Joint U.S.-Japan Employment Study (Tokyo: Ministry of Labor; and Washington, D.C.: U.S. Department of Labor, 1968), p. 148.

After the Center had initiated the work relating to aggregating insured periods (essentially an accounting-type operation), the system's functions were rapidly expanded into other labor market and manpower areas.[38] In 1965, a data transmission system between the Center and field stations was developed, the circuits being consolidated in three successive steps. This consolidation resulted in a transmission network of some 600 exclusive circuits, linking the PESOs, the prefectural office, and the Center into an electronic data communications system with over 500 terminals and a large-scale computer in the Center. The entire network went into operation in the fall of 1966. The combination of such a network with the powerful computing facility in the Center made it possible to centralize unemployment insurance operations, including those connected with premium collection (another primarily accounting operation). More importantly, the integrated data-processing system also made it feasible to consider and implement other nationwide information functions. For example, placement service was extended beyond the jurisdiction of the individual PESO in late 1965 for job applicants in general, and in mid-1966 for new graduates.

The introduction of the integrated data-processing system into the placement service resulted in the collection of information on job orders and on job applications. For instance, when a job applicant presented himself to the PESO, a job application card was prepared in consultation with a PESO staff member. This information was transformed into paper tape via type-punch typewriters, available in every PESO unit. In the transmission of the information from the original document to the prefectural offices, the paper tapes are automatically converted into electric signals, when traveling through the data transmission equipment. From there, the signals are transmitted via line concentrators and so-called time-division multiplexors (to concentrate the communications circuits and transmit the signal through high-speed circuits) to the Center. Here they are recorded on magnetic tape for processing by the Center's computer and for storage. In a similar way, the data originating from employers' job order cards are transmitted so that they may be collated at the Center with relevant job applications. Corresponding data in the form of "ledger tapes" are forwarded from the PESOs for each insured person for use by the Center computer in determining the aggregate insured period, in calculating insurance premiums, in printing notices of payment, and the like.

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[38] Ministry of Labor, Employment Security Bureau, *Labor Market Center* (Tokyo, 1967).

The resulting mass of micro data is stored by the Center for future use, especially in connection with analysis of the data from a variety of points of view. The micro information on individuals covers, among other items, occupation, age, sex, desired wage, skill grade, and preferred location. Initially, the system concerned itself primarily with referrals for jobs requiring a high level of skills; for example, codes were provided for fifty-eight specialized technical occupations and for seventeen occupations in manufacturing processes.

The system also yields vacancy statistics and data for the analysis of changing manpower-use patterns and of manpower requirements on a micro basis. And the micro information generated is useful in formulating and tracing expected results of proposed manpower policies and of manpower flows between geographic areas and industries and between establishments of different size. It can also be used to observe ongoing changes in the occupational structure and in wage trends, and for general forecasting.

The original scope of the Center was to assist in overcoming specific problems. One of these was the high unemployment rate in coal mines due to far-reaching changes in fuel technology. Another was the imbalance of manpower use among different age groups due to the pronounced demand for young, skilled workers at the "port of entry to the enterprise." Coexisting with the resulting manpower shortages was the precarious situation of the middle-aged and older worker in small and highly competitive industries. Soon, however, the Center's capability for generating masses of data on the micro level inevitably expanded its early function as a device to encourage fuller use of manpower and higher labor mobility and became a centralized vehicle for the analytical underpinning of manpower and labor market policies in general.

The framework for manpower information systems in the United States, where many independent state administrations existed, was for long an obstacle to the establishment of an integrated national system corresponding to Japan's. Here the approach has been (as earlier pointed out) more gradual and hesitant. However, a fully automated job placement system was officially established by the Utah Department of Employment Security in February 1969, as part of the so-called Model State System Project; Florida and Michigan are the other two participants in the project. There is also the earlier mentioned labor inventory communications system for matching professional jobs and men in California, Project LINCS. Other efforts include the New York City Area Manpower Data System with emphasis on providing improved services to the disabled, and the Employment Service On-Line Placement System in Wisconsin (ESOPS) for experimentation with the worker trait group concept. Valuable as the experience from these may be, the projects themselves are limited at this time to operations on subnational levels.

### *The BLS Manpower Statistics Information Program*

However, there is in operation a nationwide "general" manpower information system, i.e., a system that is not limited to man-job matching. At the beginning of the 1960's, the Bureau of Labor Statistics began to investigate the feasibility of such a system for more efficient and faster methods of producing the many recurrent tabulations that are used in its numerous statistical reports. An experimental project was set up in the Division of Systems Development to explore the problem.

Thus, as with the Japanese project, administrative considerations were initially in the foreground. However, from the beginning, the technical staff of the Division of Systems Development recognized the great potential of such a system as a statistical information storage-retrieval operation also directed toward analytical uses of the retrieved information. In other words, both the production of tables and the efficient statistical reduction of data were recognized as objectives to be included in the system's scope. In view of the very large volume of data to be stored, the second objective of course became the attractive feature of the system.

The system inputs are aggregated data for storage and retrieval, resulting from tabulations of several regular survey results. Currently, they include macro data from the following sources: the National Industry Series of Employment, Hours, Earnings, and Labor Turnover; state and area data of a similar nature; and selected series from the Current Population Survey, the Survey of Scientific and Technical Personnel, and the Occupational Employment Matrix by Industry of 1960. To this type of input are added the inputs resulting from operations undertaken to keep the data inventory current. (In the language of the systems engineer, the new inputs from the transaction tape are added to the existing information stored on the master tape.)

The output — the retrieved macro data — may be directed toward the production of tables. This is an operation for which BLS has developed a special, easy-to-use language (to be discussed later). The data may be further channeled to a FORTRAN operation, if it appears desirable to subject them to computational manipulations. This can be done by using any one of the many now existing FORTRAN programs, or by having the analyst develop and submit his own special-purpose program; only in this last case is programming by the data requestor explicitly involved.[39]

In creating the system, the Division of Systems Development staff was guided by two main considerations: (1) the need for efficient accommodation of the great masses of data involved (the number of single data items in the Bureau of Labor Statistics file was then estimated at 200 million and it grows continuously)[40] and (2) the recognition that a satisfactory information system must have the ability to serve as an adequate link between the typical data consumer and the data.

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[39] For the systems analytical potential, see Rudolph C. Mendelssohn, "The Computer and Economic Analysis at the Bureau of Labor Statistics," *American Statistician* (American Statistical Association, April 1968), p. 168.

In the present case, the most likely data users were assumed to be behavioral scientists, manpower analysts, economists, and so on — but not programmers. It appeared impractical to insert a separate programming function between the computer and the user (in part because of the shortage of skilled programmers and in larger part because of the programmer's usual unawareness of substantive issues). Thus the problem of an interface between user and machine became inportant and raised the significant issue of computer languages.

There has been a good deal of development in this field, despite its brief history.[41] For the purposes of our description here, the various approaches to the languages may be divided into procedure-oriented and problem-oriented. The first requires that the operations to be performed by the computer be spelled out step by step, first in binary notation, then in decimal machine language, in mnemonic code, and more recently in sophisticated and efficient languages such as FORTRAN. Problem-oriented languages, on the other hand, make it possible for the user to talk to the computer in his own language, stating the end result he desires rather than specifying the procedure — i.e., the steps which the particular computer must follow to arrive at the desired end result.

The language used in the BLS system is problem-oriented, although the information system also permits the use of FORTRAN. Examples of the sublanguages now available in the dictionary for the user of the BLS system are: common English, (e.g., such words as industry, occupation, date); professional jargon (e.g., subtitle, three-digit industry); abbreviations of words (e.g., dvind, for industry division, stnumeric, for numeric state code); and numeric codes contained in manuals (e.g., the set-coding manual for the Current Population Survey data).

Therefore, the analyst may quite easily learn the vocabulary, the use of the codes, and the procedures to follow in speaking with the system. The time required to do so is estimated at approximately two days. The writing of complex data search statements is further simplified by the use of a device called the intersect statement. For instance, if (as is frequently the case) data are to be retrieved for a series of ten years, and within the years for, say, each of twelve months, the statement need not be rewritten for each of the twelve by ten months;

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[40] Bureau of Labor Statistics Memorandum from Thomas M. Ryan to Rudolph C. Mendelssohn, December 20, 1966, p. 20.

[41] Mendelssohn, *op. cit.* (see our footnote 31 above); also see Bernard A. Galler, *The Language of Computers* (McGraw-Hill, 1962).

two lists can be prepared — one containing the ten specific years, the other the twelve months. The computer is eminently suited for performing such repetitive processes and can be directed to "intersect" the two lists successively. The use of the intersect statement therefore greatly simplifies the analyst's task in writing a search statement, but, if a layout statement or time-sequenced data are to be arranged in tables or to be subject to time series analysis, the application of the intersect technique is also most useful. The intersection of lists can of course be used to advantage in situations other than those involving time series type of data, and the procedure can be used for intersecting more than two lists. A simplified flow chart that typifies the system is shown in Figure 2.[42]

By the late 1960's the BLS system had established itself as the largest single storage-retrieval operation in the federal government, and the "interface" problem — that is, communications between data user and machine — seemed to be satisfactorily solved. However, if the program is examined as a "complete" system, there is one serious limitation: it presently accepts only macro information.

To alter a macro information system so that it will also accept micro data is a complicated task. The mass of micro data exceeds the mass of macro data quite substantially and additional problems arise in respect to "interface" and to file management and file maintenance. For manpower statistics, the problem of micro information is perhaps less serious than for any other form of economic statistics, because the basic unit or building-block, i.e., the micro-element, is well defined and clear: as a rule, it is a person.

However, numerous problems remain — for example, the incompatible definitions used by various agencies for employment or unemployment and the Standard Industrial Classification (SIC) of particular establishments of the employed. This is not, of course, a unique weakness of micro data; in a decentralized system it is inherent in macro data as well. But there it is less apparent and more easily overlooked by the data user if he limits himself to statistical material generated by one agency. It is now generally recognized that the generating agency should edit its own data for presentation and make them internally consistent and properly qualified. However, when micro-records accruing to different agencies are to become inputs for the same system, say, for record linkage, this preparatory and editorial task must, in the absence of a focal authority on operating levels, be undertaken by the file management function of the storage-retrieval system itself.

A micro system, because of its impressive size, also requires extensive computer hardware, far exceeding the capabilities of equipment that is adequate

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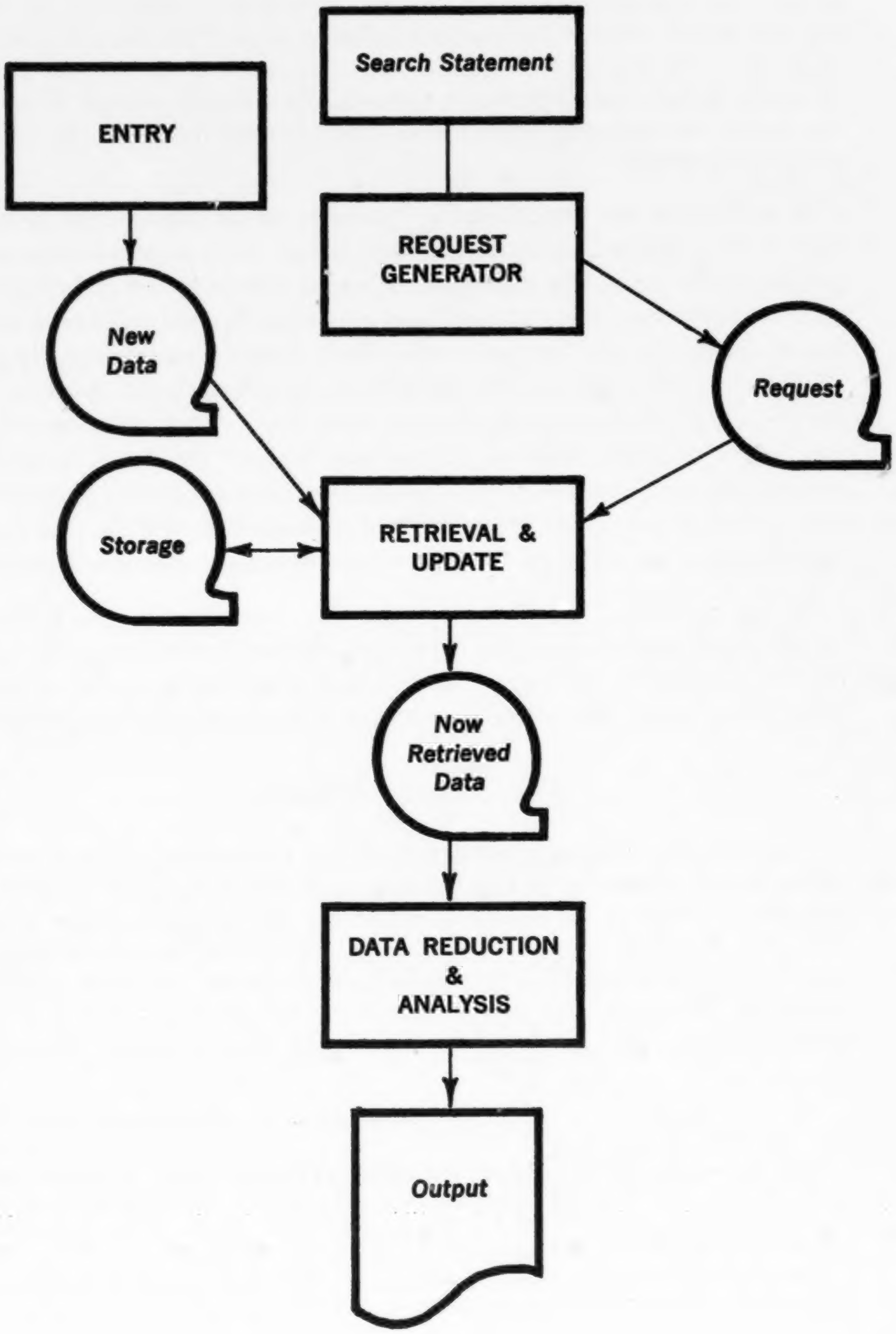
[42] For a detailed description, see Rudolph C. Mendelssohn, *The BLS Information System:* Background and Principle; *ibid.*: Search Statement Manual; *ibid.*: A Systems Manual (U.S. Department of Labor, 1967).

## Figure 2

## Data-Storage and -Retrieval Systems


Search Statement
ENTRY
REQUEST GENERATOR
New Data
Request
Storage
RETRIEVAL & UPDATE
Now Retrieved Data
DATA REDUCTION & ANALYSIS
Output

for handling the corresponding volume of macro information. This in turn complicates the "interface" question. One of the foremost functions of a manpower micro data storage-retrieval system is to serve as an instrument for relating information derived from several different sources but pertaining to the same unit. This capability of collating the information of several unit records is usually called "record linkage." Conceptually a simple enough device, its translation into operating practice does pose questions for which the answers are not at all simple.

In addition to the "housekeeping" problems in file management to make micro information at all amenable to record linkage, there are also technological problems to be faced. The importance of record linkage for use in broadening an information base seems to have been recognized by vital and health statisticians long before the "computer revolution." Nearly a century ago, the possibility of bringing together separate records concerning health events in the life of an individual was envisaged for a whole population by William Farr of the General Register Office of England and Wales.[43] He clearly recognized the importance of data which would permit both cross-section and longitudinal analysis, but, because of the impossibility of implementing record linkage on the technological level, no actual linking attempts were made until much later.[44]

We are not saying that a "total" system (i.e., one accepting also micro information) presents insuperable difficulties, but rather that it requires a substantial lead time for its design. One such system, aiming at population census data, is now being designed for use with the Australian population census.[45]

## *The "Privacy" Dilemma*

A more serious obstacle which any micro data bank seems to face, especially in the present climate in the United States, is its real or imagined threat to the so-called "privacy of individuals." Almost any technological change usually confronts distrust and apprehension. Computerized information technology, in particular, seems to provide a convenient outlet for heated and often politically motivated controversy. No wonder, therefore, that politicians as well as congressional committees get deeply involved in the often emotional altercations centered on the problem of computerized information systems.[46] Evoking the image of "Big Brother" appeared to some newspapers and writers as a convenient way to attack the newly developing information technology.

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[43] W. Farr, *Supplement to Thirty-Fifth Annual Report of the Registrar General* (London:H.M.S.O., 1875), p. 110.

[44] See, for instance, E. D. Acheson, "Oxford Record Linkage Study," in *British Journal of Preventative and Social Medicine,* Vol. 18 (1964), pp. 8 ff.; and J. M. Kennedy, 1961 (as cited in our footnote 29, above); also consult "Use of Vital and Health Records in Epidemiology Research" (as cited at end of our footnote 29, above).

[45] See *Table Generator (Version III):Programmer's Reference Manual* (Commonwealth of Australia, Bureau of Census and Statistics, ADP Branch, 1968).

In the course of the numerous arguments about micro information systems, certain identifiable themes have emerged.

*The right to privacy.* In the many recent discussions of this issue, the argument sometimes intimated that the right to privacy is a fundamental freedom guaranteed by the Constitution. Support for this position seems doubtful. When the question was posed before the Supreme Court in March 1965, the decision in Griswold et al. *vs.* Connecticut (381 U.S. 530), although affirming the right to privacy, found that it could not be derived from the Bill of Rights but might have to be based on natural right and moral values.[47] Such values, however, are closely associated with cultural and social behavior and deeply imbedded in our social structure. And as this structure changes, so do some of the values; in particular, the outlook changes on the mutual relationship between community and individual, and on the role and responsibility of the government versus the role and responsibility of the citizen. Within this framework, the concept of privacy takes on a complex and chameleon character — in both law and common language. The literature of anthropology abounds with examples of what has and what has not been considered "private" in different cultures at different times. Changing population density, rates of interaction, and the nature of the family are all considered determinants of privacy. And urban society is shown to have privacy standards and problems that differ from those of rural society.[48]

*Protection against disclosure of privileged information.* An important practical problem for the manpower statistician involves the matter of confidential information.[49] Much of his data is derived from surveys, including censuses, in which the respondent is promised confidential treatment of the information. Thus, an automatic safety device protecting the respondent is built into the data-generating process. If the respondent develops any doubts about the actual protection of his privacy, his response willingness will rapidly decrease. This may not immediately result in his refusal to answer questions, but in more or less skillful attempts to "adjust" the figures. In addition, then, to the ethical issue, there is a significant theoretical decision problem faced by the management of a microdata bank: the choice between the positive payoff associated with disclosure of information (output), and the negative payoff resulting from a gradual drying up of the essential raw material base (input). Most statistical agencies in the United States are well aware of the problem and sensitive to it. Bolstered with the applicable provisions of the penal code, with internal rules and regulations, and supported by administrative arrangements and penalties, they have been generally successful in maintaining what appears a near-optimum balance between the two kinds of risks.

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[46] Some of the more instructive government documents that also contain illuminating materials in their appendixes are *Computer Privacy,* Hearings Before the Judiciary Committee's Subcommittee on Administrative Practices and Procedures, 90th Congress, 1st Session (March 14 and 15, 1967); *The Computer and Invasion of Privacy,* Hearings Before a Subcommittee of the Committee on Government Operations, 89th Congress, 1st Session (June 2-4, 7, and 23, and September 23, 1965, and in 89th Congress, 2d Session, July 26-28, 1966); *Privacy and the National Data Bank Concept,* 35th Report of the Senate Committee on Government Operations, 90th Congress, 2d Session (1968); and *Privacy and Behavioral Research,* Executive Office of the President, Office of Science and Technology (February 1967).

[47] The majority opinion, written by Justice William O. Douglas, relied on a general right of privacy "older than the Bill of Rights — older than our political parties." The minority opinion by Justice Potter Stewart questioned the legal basis altogether: "What provision of the Constitution, then, does make this state law invalid? The Court says it is the right to privacy created by several fundamental Constitutional guarantees. With all deference I can find no such general right of privacy in the Bill of Rights, in any other part of the Constitution, or in any case ever before decided by this Court."

[48] See Arnold Simmel, "On Privacy," in *International Encyclopedia of the Social Sciences,* Vol. 12, pp. 480 ff.

As to manpower information systems in particular, this delicate problem can be simplified further by strictly limiting output to aggregated data. There are no relevant statistical situations which require the analyst's access to information on individuals as such. A manpower statistics system, if properly designed, would itself become a potent protector of confidentiality because of the anonymity which can be maintained in internal computer operations.

As a consequence of our decentralized statistical system, however, disclosure policies and practices of government agencies vary widely. An information system could perform a very useful service as a guide toward achieving greater compatibility of such rules and policies from the standpoint of overall retrieval operations. In the cases where data from different sources are to be combined, the standards of the agency having the most stringent disclosure policies would, as a rule, be applicable.

*The security problem.* Provision must also be made for the physical protection of the information in a data bank. Any storage of important and secret information is exposed to the risk of being "burglarized"; many techniques are used to reduce this risk, but none are foolproof. Therefore, absolutely effective protection can only be obtained by excluding critical information from being an input to the data bank. (An example would be dossier type of data on individuals which for the usual type of statistical analysis of manpower is of little, if any, interest.)

Fear about security breaches of data banks is closely associated with the misgivings about the working and operation of the computer. But such breaches are also of concern to designers and managers of the emerging computerized information utilities. The problem is further complicated when a central computer is located in one place and input/output devices (the so-called terminals) are elsewhere. The intervening communications channels will, of course, also have to be protected.

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[49] A description of confidentiality conditions in Europe is found in George Als, "Statistical Secrecy and Related Juridical Principles in Statistical Planning," in *Statistisk Tidskrift* (Stockholm, 1967), which points to the greater ease with which such questions can be handled in countries with a more nearly centralized statistical system.

The risk of unauthorized access to confidential information has been recognized to exist even on the relatively much smaller scale of internal computerized information systems in private companies and comparable organizations. The producers of computer facilities have therefore been well aware of the importance of helping users of information systems to control access to the information. Numerous control contrivances have been devised and are in use, most of them based on special purpose codes, "passwords," and keys. It has been said that "privacy rests not with machines but with men" and that "machines have no morals, no ethics; men have ethics and morals."[50] Hence, the tendency has been to automate as much as possible of the "control" necessary to obtain the required data security and to reduce the risk of exposure to human frailty. An example is the use of "security sets," — a file set whose name and/or entries represent secret passwords.[51] The corresponding exit fields contain the "keys" (real names of other sets). To obtain the key that gives access to a set, the user must supply the correct password. Depending on the required degree of security and the permissible cost of the protective device, several levels of security may be used. The first password may refer to the master file; the corresponding key operates a security set in which the new password refers to a key for the second security set, and so on. The passwords on each level may be supplied by different persons so that access to the data set itself requires the simultaneous authorization of several people. It is not unrealistic to visualize a situation in which the computer would recognize signatures and fingerprints, and give access to the data set only after having recognized and verified the authorized person's "fingerprint." Codes can, of course, be broken and locks unlocked by "unauthorized" persons; however, the more complex the locking device, the more expensive the attempt to break in.

Actually, manpower information of the kind here considered is not precious in the sense of being above price (unless it reflects historical records which cannot ever again be reconstructed). Thus, there is a necessary breakeven point beyond which the cost of unauthorized access exceeds the cost of generating the information. The ultimate answer to the question could conceivably be obtained through a cost-utility approach.

Again, the solution of such problems could be greatly facilitated if there were a focal point in government — such as a data center, which would be provided with staff competent to explore such problems, and to propose solutions on the basis of operating experience with particular information systems and particular data banks.

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[50] Testimony of Emmanuel R. Piore, in *Computer Privacy, op. cit.*, pp. 122 ff. (see our footnote 46 above).

[51] For more details, see Nordbotten, *op. cit.*, p. 17 (see our footnote 26 above).

In the heat of the arguments about Big Brother's computer invasion of privacy, the real problems and issues tend to be overlooked. And the most important issue is whether the information, once collected, is to be organized in a central computerized manpower statistics storage-retrieval system. Such a data organization, amenable to new and powerful information technology, would permit a more efficient exploitation of the already collected statistics and, in the long run, would probably revolutionize our present concepts and practices regarding conventional data publication methods and procedures. For example, the volume of present publication could undoubtedly be reduced to a relatively few general-purpose tables.

If there is justification for creating "a climate of concern"[52] about the alleged threat to individual privacy posed by statistical information systems, equal concern should surely be expressed about the "right to know."[53] Freedom from invasion of privacy must be balanced against freedom from ignorance and from subjection to arbitrary rules and regulations based on incomplete documentation and on inference from deficient information. Policies and laws to limit access to and use of the best and most complete information available would seem not to be in the best interest of individuals, communities, or (possibly most of all) Congress itself. Such information can assist the evaluation of legislative proposals and, because it is firm information, help to counterbalance the growth of executive power with corresponding growth of congressional capability. In other words, information is an important requirement for the process of developing policy (in which the analyst of information plays a large role) and legislation to implement the policy.

There can be little doubt that concentration of power, together with advancing technology, can become "catastrophically dangerous."[54] But such catastrophic danger is rapidly becoming much more acute in connection with technologies other than information — for example, weapons systems and space technology developments.

Any man-made tool can be misused by a man. The fateful dilemma facing us, to which we have no certain answer, is whether man's tools will be used for his liberation or subjugation. The central issue appears to be moral and ethical rather than technological. Within this somewhat awesome context, one may hope that the ethical as well as the technological problems associated with the relatively minor issue of manpower data banks will find a reasonable solution. If so, a nationwide data storage-retrieval system applicable to manpower information may become a reality before too long — although perhaps later than hoped for by some of its fervent proponents.

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[52] *Privacy and the National Data Bank Concept*, Hearings (1968), p. 10 (see our footnote 46 above).

[53] See Samuel Warren and Louis D. Brandeis, "The Right of Privacy," *Harvard Law Review*, Vol. 4 (1890).

[54] Alan F. Westin, *Privacy and Freedom* (Atheneum, 1967), p. 167.